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Abstract: This Supplemental Draft Environmental Impact Statement (EIS) is a public document that discloses the direct, indirect, and cumulative effects of the proposed action and alternative actions for the Stibnite Gold Project. This document follows the format established in the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508). It includes a discussion of the purpose and need for the proposal; alternatives to the proposal; the physical, biological, social, and economic impacts of the proposed action and alternatives; and a listing of agencies and persons consulted. The document tiers to and incorporates by reference material in the Final EIS and record of decision (ROD) for the 2003 Land and Resource Management Plan (Forest Plan), as amended for the Payette National Forest, and the Final EIS and ROD for the 2010 Boise Forest Plan.

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Submit Electronic Comments To: https://www.fs.usda.gov/project/?project=50516

Please state “Stibnite Gold Project” in the subject line when providing electronic comments, or on the envelope when replying by mail. Electronic comments must be submitted in a common digital format such as plain text (.txt), rich text format (.rtf), Word (.doc, .docx) or PDF (.pdf).

Project Website: https://www.fs.usda.gov/project/?project=50516


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Executive Summary

Introduction

The Stibnite Gold Project (SGP) proposes mine operations on federal, state, and private lands located in Valley County, Idaho. This supplemental draft Environmental Impact Statement (SDEIS) was prepared in response to a revised Plan of Restoration and Operations (Plan) for the SGP. The Forest Service received the original SGP Plan in 2016, (Midas Gold Idaho, Inc. [Midas Gold] 2016a) for review and approval in accordance with regulations at 36 Code of Federal Regulations (CFR) 228 Subpart A. A revised Plan was submitted to the Forest Service in 2019 (Brown and Caldwell 2019a). A draft EIS (DEIS) evaluating five alternatives based on the revised Plan was released by the Forest Service in August 2020. A further modified Plan was initially submitted by Midas Gold in December 2020 with a revised submittal in October of 2021 (Perpetua 2021a). Midas Gold changed their name to Perpetua Resources Ltd (Perpetua) in February 2021. In consideration of the modified Plan, the Forest Service determined that a SDEIS is warranted and based on further analysis, two of the previous action alternatives (August 2020 DEIS Alternatives 1 and 3) were eliminated from further consideration. The SDEIS therefore evaluates the Proposed Action, the Johnson Creek Route Alternative, and the No Action Alternative.

The Forest Service, specifically the Payette National Forest, is the lead agency in the preparation of this SDEIS (40 CFR 1501.5). The Boise National Forest is participating, as well as cooperating agencies including the U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), Idaho Governor’s Office of Energy and Mineral Resources (OEMR), Idaho Department of Lands (IDL), Idaho Department of Environmental Quality (IDEQ), and Valley County, Idaho.

Purpose and Need

The Forest Service’s purpose is to consider approval of Perpetua’s proposed use of the surface of NFS lands in connection with operations authorized by the U.S. mining law as first described in the Plan submitted September 2016, then refined in 2019 (Brown and Caldwell 2019a), and further modified in 2021 as the 2021 Modified Mine Plan (MMP; Perpetua 2021a). The Forest Service’s need for action is established by the agency’s responsibility under the Locatable Minerals regulations at 36 CFR Part 228, Subpart A and the General Mining Law of 1872 (Mining Law), as amended (30 U.S.C. 22 et seq.). The need for action is to:

- Consider approval of Perpetua’s 2021 MMP for development of the SGP to mine gold, silver, and antimony deposits that, where feasible, would minimize adverse environmental impacts on NFS surface resources; and ensure that measures are included that provide for mitigation of environmental impacts and reclamation of the NFS surface disturbance.

Perpetua’s 2021 MMP includes the discharge of dredge and fill material into waters of the U.S. (WOTUS), including wetlands. Accordingly, the USACE, pursuant to Section 404 of the Clean Water Act (CWA), will review the SGP and render a decision to either issue, issue with special condition, or deny a permit for the Project. As a cooperating agency the USACE intends to use this EIS process and document for evaluating compliance with its responsibilities under NEPA and the CWA Section 404(b)(1) Guidelines. As part of its review, the USACE is required by the CWA to independently
consider and express the activity’s underlying purpose and need from Perpetua’s (the applicant) and the public’s perspectives (33 CFR 325).

From the USACE’s perspective, the basic purpose for the SGP is to extract gold, silver, and antimony from ore. Under the CWA Section 404(b)(1) Guidelines (40 CFR 230), the USACE uses the basic project purpose to determine if a project is “water dependent.” A project is water dependent if it must be located in, or be close to, a special aquatic site, including wetlands, to fulfill its basic purpose. The USACE has determined that mining gold, silver, and antimony ore is not a water-dependent activity. The overall project purpose is to mine gold, silver, and antimony from ore deposits associated with the SGP. This overall project purpose will be used for evaluating practicable alternatives under the 404(b)(1) guidelines. The 404(b)(1) analysis will be completed by the USACE following the receipt of public comments on both this SDEIS and Perpetua’s application for a Department of the Army (DA) permit for the SGP.

Federal Decision Framework
The U.S. mining laws (30 U.S.C. 21-54) govern exploration and development of mineral resources on public lands. Locatable minerals operations on NFS lands are subject to regulations found at 36 CFR 228 subpart A. Locatable mineral operations are to be conducted so as to, where feasible, minimize adverse environmental impacts on National Forest surface resources (36 CFR 228.8). In prospecting, locating, and developing the mineral resources, all persons must comply with the rules and regulations covering the National Forests (16 U.S.C. 478). All functions, work, and activities on NFS lands in connection with prospecting, exploration, development, mining, or processing of mineral resources and all uses reasonably incident thereto, including roads that are constructed and maintained in connection with development and mining of mineral resources, are operations authorized by the U.S. mining laws (36 CFR 228.3(a)).

The Forest Service is the lead agency in the preparation of this document (40 CFR Part 1501.5). The USACE is a federal cooperating agency with decisions to be made based on this environmental analysis consistent with the NEPA. Other federal, state, and local agencies are also participating in this review as cooperating agencies.

The Payette Forest Supervisor, as the responsible official acting on behalf of the lead agency, has determined that preparation of an EIS is required because approving the 2021 MMP may have significant impacts on the human environment (40 CFR Part 1501). The Payette Forest Supervisor will make the following decisions:

- Whether to approve the 2021 MMP as submitted, or any alternative considered in detail in the final EIS (FEIS).
- Whether to amend¹ the Payette Forest Plan (FEIS and Record of Decision for the Revised Payette Land and Resource Management Plan, 2003 is incorporated by reference). One or more project-specific amendments to the forest plan would be required.

¹ Forest plan amendments are evaluated under the 2012 Planning Rule per 36 CFR Part 219.17(b)(2), which requires all forest plan amendments initiated after May 9, 2012, to use the 2012 Planning Rule.
The Boise Forest Supervisor will make the following decisions:

- Whether to amend the Boise Forest Plan (FEIS and Record of Decision for Revised Boise Land and Resource Management Plan, 2010 is incorporated by reference). One or more project-specific amendments to the forest plan would be required.

The Payette and Boise Forest Plans provide direction relevant to the 2021 MMP and its alternatives through forest-wide plan components and management areas. Management Areas (MAs) in the SGP area include the following:

**Payette National Forest**

- Management Area 13 Big Creek/Stibnite

**Boise National Forest**

- Management Area 17 North Fork Payette River
- Management Area 19 Warm Lake
- Management Area 20 Upper Johnson Creek
- Management Area 21 Lower Johnson Creek

Amendments to the Payette and Boise Forest Plans would be required to approve the 2021 MMP or the Johnson Creek Route Alternative. A forest plan may be amended at any time. The responsible officials (Boise and Payette Forest Supervisors) have the discretion to determine whether and how to amend the plan(s) and to determine the scope and scale of any amendment. A plan amendment is required to add, modify, or remove one or more plan components. The proposed removal of the below identified forest plan Standards would be one-time amendments to the current forest plans and would be project-specific and apply only to the SGP. These amendments would be made according to the 2012 Planning Rule (36 CFR Part 219.13) and will comply with the direction in both forest plans relating to Standards.

Opportunities for public participation and notification regarding the forest plan amendments will be combined with the public participation and notification processes used for project planning at 36 CFR Part 218 for this EIS (36 CFR 219.13). The project-specific amendments for this Project may have effects directly related to 2012 planning rule’s substantive requirements regarding sustainability (Section 219.8), plant and animal community diversity and persistence of native species (Section 219.9), multiple use (Section 219.10), timber (Section 219.11), and others.

Forest Plan amendments, summarized in Table ES-1, could be needed in four resource topics, depending on the action alternative selected, to allow the SGP to be consistent with the Payette and Boise Forest Plans.
The USACE, under Section 404 of the CWA, will review the Project and either issue, issue with special conditions or deny a permit for the Project. The USACE regulates the discharge of dredged and/or fill material into WOTUS, including wetlands (Section 404 of the CWA). The 2021 MMP would place dredged and/or fill material in WOTUS as regulated under Section 404 of the CWA. A CWA Section 404 permit is required for the discharge of dredged and/or fill material into jurisdictional WOTUS (33 CFR Part 323).
In accordance with the CWA Section 404(b)(1) guidelines (40 CFR Part 230), the USACE may permit only the least environmentally damaging practicable alternative while considering cost, logistics, and technology. The USACE has determined that potentially jurisdictional WOTUS, including wetlands, are present that may be impacted by the Project. These waters are described in the “Wetlands and Riparian Resources” section of Chapter 3.

**Proposed Action (2021 MMP)**

The revised Plan submitted by Perpetua in October 2021 is considered to be the Proposed Action, also known as the 2021 MMP, and would consist of mine operations, including an open pit hard rock mine and associated processing facilities, located within Valley County in central Idaho on federal, state, and private lands (Figure ES-1). The SGP would produce gold and silver doré, and antimony concentrate, for commercial sale by Perpetua. The SGP would have a life (construction, operation, closure, and reclamation), not including post-reclamation monitoring, of approximately 20 years, with active mining and ore processing occurring over approximately 15 years.

The following mine components would be common to the two action alternatives:

- Mine pit locations, areal extents, and mining and backfilling methods
- Transportation on existing and proposed roads
- Pit dewatering, surface water management, and water treatment
- Ore processing
- Lime generation
- Tailings storage facility (TSF) construction and operation methods
- TSF Buttress construction methods
- Water supply needs and uses
- Management of mine impacted water and stormwater runoff
- Stibnite Gold Logistics Facility (SGLF)
- A road maintenance facility
- Surface and underground exploration
- Worker housing facility

For access, the 2021 MMP would utilize Warm Lake Road, Johnson Creek Road, and Stibnite Road during construction of the proposed Burntlog Route; then once constructed, the Burntlog Route would be the primary access route during operations and reclamation.
Johnson Creek Route Alternative
The Johnson Creek Route Alternative was developed to evaluate potential reductions in impacts to various resources caused by the Burntlog Route. The mining portion of this alternative would be the same as under the 2021 MMP. Therefore, the primary focus of the Johnson Creek Route Alternative would be using an existing route, with improvements, for mine access during operations and reclamation instead of the Burntlog Route that requires new road construction in Inventoried Roadless Areas (IRAs). The Johnson Creek Route Alternative would require extensive upgrades to both Johnson Creek Road and Stibnite Road. The construction schedule for upgrading the roads and construction of the SGP would increase from 3 years to 5 years under this action alternative.

No Action Alternative
The No Action Alternative provides an environmental baseline for comparison of the action alternatives. Under the No Action Alternative, the mining, ore processing, and related activities under the 2021 MMP or the Johnson Creek Route Alternative would not take place. In addition, certain legacy and existing mining impacts would be addressed as directed in the 2021 Administrative Settlement Agreement and Order on Consent, including installation of stream diversion ditches designed to avoid contact of water with sources of contamination and removal of development rock and tailings currently impacting water quality. However, existing and approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue and Perpetua would not be precluded from subsequently submitting another plan of operations pursuant to the General Mining Law of 1872.

Agency Preferred Alternative
Following their review of the environmental impacts as discussed in the SDEIS, the Forest Service has identified the 2021 MMP as their Preferred Alternative for the SGP because this alternative:

- Incorporates water management and closure activities to reduce the duration of long-term water treatment requirements.
- Incorporates measures to manage stream temperatures.
- Reduces the potential for impacts associated with access, transportation, and hazardous materials on Johnson Creek and the East Fork SFSR downstream of the Operations Area Boundary.

The Agency Preferred Alternative would reasonably accomplish the purpose and need for the federal action, while giving consideration to environmental, economic, and technical factors.

Environmental Impacts

Geologic Resources and Geotechnical Hazards

**Extraction of Mineral Resources**
Geologic studies by Perpetua have reported approximately 132.3 million tons of measured and indicated ore resource (including historical tailings) for the SGP property with another 36.2 million tons of inferred ore. Under the 2021 MMP, approximately 280 million tons of development rock and 112 million tons of ore would be mined. About 3.2 million tons of historical Bradley tailings "ore" would also be removed and reprocessed. Total ore processed would be 115.2 million tons. The extraction of mineral resources would be the same for the 2021 MMP and the Johnson Creek Route Alternative.
LEGEND

Project Components

SGP Features
Operations Area Boundary
Access Roads and Trail System
Burnt Log Route *
Johnson Creek Route
Utilities
Upgraded Transmission Line
New Transmission Line
Offsite Facilities
Burnt Log Maintenance Facility *
Landmark Maintenance Facility **
Stibnite Gold Logistics Facility

Other Features
U.S. Forest Service
Wilderness
IRA and/or Forest Plan Special Area
County
City/Town
Monumental Summit
Airport/Landing Strip
Railroad
Highway
Road
Stream/River
Lake/Reservoir

* Associated with 2021 MMP only
** Associated with Johnson Creek Route Alternative only

Note:
The McCall - Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.

Surface Management

Bureau of Land Management

Bureau of Reclamation

Private

State

U.S. Forest Service

Figure ES-1
SGP Overview and Location
Stibnite, ID

Forest Service Road Number | Road Name | Map Label
---|---|---
FR 447 | Burnt Log Road | 447
FR 467 | Cabin Creek Road | 467
FR 51290 | Warm Lake Lookout Road | 51290
FR 474 | South Fork Road (BNF) | 474
FR 51374 | South Fork Road (PNF) | 51374
FR 440 | Thunder Mountain Road (BNF) | 440
FR 50375 | Thunder Mountain Road (PNF) | 50375

* Associated with 2021 MMP only
** Associated with Johnson Creek Route Alternative only

Note:
The McCall - Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.
The contained metal content in the 2021 proven and probable mineral reserve of the property is approximately 4.819 million ounces of gold, 6.431 million ounces of silver, and 148.686 million pounds of antimony. From the total ore currently planned to be mined the SGP is estimated to recover, over 15 years of mill production, 4.238 million ounces of gold, 1.710 million ounces of silver, and 115.342 million pounds of antimony.

**Topography**

Mining under the 2021 MMP would result in expanded open pits at the Yellow Pine and West End deposits and a new open pit at the Hangar Flats deposit. Each of these pits would result in highwalls developed in rock that would permanently remain after mining. These highwalls are geotechnically designed to be stable and would be permanent features imposed on the topography of the site. Each of these pits would also be backfilled with development rock to a certain degree which would bury certain portions of the open pits and their highwalls.

Other major changes to local topography would include the proposed TSF and the TSF Buttress. Smaller changes to topography would occur due to engineered cuts and fills at constructed haul roads, processing facilities, and ancillary facilities. The Burntlog Route access road would also be constructed with engineered cuts and fills that would change the topography along its route. The effects of the mine operations on topography would be the same for the 2021 MMP and the Johnson Creek Route Alternative. Topographic impacts from construction of the Johnson Creek Route would be different than the 2021 MMP, but when considered in total along with the other mining related topographic impacts, the differences in total project impacts to topography between the two road alignments would not be significant.

**Geotechnical Stability**

Some SGP facilities would have exposure to potential geotechnical impacts from existing landslides, rockfalls, and avalanche paths. SGP facilities to be located in the vicinity of these hazards would include designs and operational procedures to reduce risk to workers and operations.

Geotechnical stability of the SGP facilities would be ensured by practices for design, construction, and operation of the facilities. Studies have been conducted to characterize the geologic conditions of the foundation areas of these facilities and these characteristics have been incorporated into the designs of the facilities.

The designs of major earth fills such as the TSF and TSF Buttress have incorporated slope stability analyses including the potential effects of earthquakes. Impacts from earthquakes on these and other SGP facilities would be minimized by incorporation of existing geotechnical design standards and building code standards, as well as construction quality control, operations and maintenance, and surveillance.

The hazards from mass wasting events along the Johnson Creek Route would be increased compared to the Burntlog Route. There are more areas of landslides and rockfalls along the Johnson Creek Route (45) than there are along the Burntlog Route (26). Potential avalanche paths crossed by the Johnson Creek Route (94) are more numerous than the Burntlog Route (38) and are more significant in size than along the Burntlog Route. The increased numbers of mass wasting hazards along the Johnson Creek Route
would be expected to result in an increased number of temporary road closures and possible accidents involving vehicles than the Burntlog Route.

**Air Quality**

The air quality analysis conducted for the SGP examined impacts on defined geographic regions that relate to different types of modeling processes. First, a “near field” region surrounding the SGP was examined using air dispersion models to quantify pollutant concentrations and related impacts.

Second, a much larger “far-field” region was defined that encompassed more-distant Class I areas, wilderness areas, and tribal lands. In these areas, specialized air quality modeling tools were applied to evaluate the combined effects of dispersion, deposition, and chemical transformations in the atmosphere. The models assessed SGP source contributions to regional haze, nitrogen deposition, and sulfur deposition.

**Extent of Pollutant Concentrations and Deposition**

Dispersion modeling based on a representative mine operating scenario and the year with highest estimated aggregated air emissions, demonstrated that pollutant concentrations at the Operations Area Boundary would not exceed the National Ambient Air Quality Standards (NAAQS). This conclusion applies for both action alternatives. Deposition of mercury (Hg), and nitrogen and sulfur species were predicted to be less than Significant Impact Levels (SILs). A supplemental Hazardous Air Pollutants (HAPs) modeling analysis was also completed for all sources and compliance with the state acceptable ambient concentrations was demonstrated.

The SGP emission sources for the Johnson Creek Route Alternative are essentially the same as the 2021 MMP. Under the No Action Alternative, the SGP would not be constructed, so the air quality in the area would be unaffected by the 2021 MMP.

**Type and Volume of Air Pollutants Emitted**

To characterize the highest anticipated annual emission levels for purposes of conservative air quality impact analysis, a complete emission inventory was compiled for each year from construction through Life of Mine (LOM) Year 18. The year of peak mine throughput, LOM Year 6, was found to have the highest aggregate pollutant emissions, including haze precursors, airborne dust, and HAPs.

**Criteria Air Pollutant Ambient Concentrations Outside the Operations Area Boundary**

Dispersion modeling based on the 2021 MMP inventory demonstrated that impacts would not exceed NAAQS outside the operations area boundary. A supplemental HAPs analysis for all potential emission sources and each mine year was analyzed and demonstrated compliance with both the carcinogenic and non-carcinogenic acceptable concentrations. The Johnson Creek Route Alternative does not entail emission source differences of a permanent nature (e.g., roadway construction emissions) that result in long-term criteria pollutant impacts that differ from the 2021 MMP findings, respectively.

**Comparison of Modeled Concentrations to Class I and Class II Increments**

Both near-field and far-field modeling demonstrated that the Class I and Class II air quality increments would not be exceeded outside the Operations Area Boundary. Although evaluation of incremental air
quality impacts is not applicable to minor sources such as the SGP, this provided an indicator of relative SGP impacts under the 2021 MMP.

**HAP Emissions and Hg Deposition**

Emissions of HAPs, including mercury, were quantified for the worst-case LOM Year. Additionally, hydrogen cyanide (HCN), sulfuric acid, Hg, and organic HAPs from fuel combustion, were found to be well below federal major source thresholds. Near-field deposition analysis for Hg indicated that even the maximum predicted deposition rates would be less than significance thresholds.

**Deposition Impacts for Nitrogen and Sulfur compounds at Class I areas and Specified Class II Wilderness Areas**

Predicted deposition impacts, in grams of pollutant per hectare per year, were obtained from far-field modeling for the 2021 MMP peak year emissions. The modeled results were compared to the federal Deposition Analysis Thresholds (DAT) for the three modeled years of 2015 through 2017, the maximum predicted annual deposition rates were below the DAT in each Class I and Class II area evaluated.

**Near-field Plume Blight and Far-Field Regional Haze Impacts**

The Level 2 screening analysis addressed an observer in the nearby Frank Church River of No Return Wilderness (FCRNRW) and demonstrated that the aggregated emissions from the 2021 MMP would have the potential to cause short-term, visible plumes at that wilderness area.

For analysis of regional haze impacts, maximum 24-hour SGP source emissions of SO₂, NOₓ, SO₄, and fine and coarse PM were modeled. The level of regional haze impact in the Class I and Class II areas evaluated was predicted to be minor.

**Climate Change**

The 2021 MMP would create a maximum of 200,671 metric tons of CO₂e annual direct Green House Gas (GHG) emissions. Indirect GHG emission sources associated with this proposal include electrical power generated off-site (but used on-site [97,119 MT]), and emissions from off-site antimony concentrate transport and processing (4,055 MT). Therefore, the total direct and indirect GHG emissions are 301,845 MT. This equates to approximately 0.96 percent of the most recent annual Idaho statewide total GHG emissions (2018). Changes in hydrologic patterns, temperature, and extreme weather events would contribute to a varying level and degree of impacts to resources.

Changes in hydrologic patterns and overall increasing temperatures are expected to result in decreased or degraded soil moisture and quality, air quality, annual streamflow, groundwater recharge, and water quality. Increased surface water temperatures; increased spread of insects and diseases; changes in the timing, duration, and severity of fire seasons; as well as habitat loss and fragmentation also are expected to occur. Closure and reclamation activities under the alternatives could reduce climate change impacts by improving soil quality and implementing best management practices during all phases of the SGP.

Although geotechnical design standards have been developed to help minimize and lessen the extent of potential stability impacts, extreme precipitation events and flash flooding, could lead to more frequent and severe landslides and avalanches. Road maintenance during all SGP phases would improve resilience of the access roads and transportation infrastructure against climate change impacts.
Direct and indirect GHG emissions and their associated impacts would be the same under the Johnson Creek Route Alternative as those discussed under the 2021 MMP.

Baseline conditions would continue and direct and indirect GHG emissions in the vicinity of the SGP area would not change under the No Action Alternative. No additional impacts beyond current trends are expected to occur to the physical, social, and biological resources in the area.

**Soils and Reclamation Cover Materials**

**Total Soil Resource Commitment (TSRC)**

TSRC is the conversion of a productive site to an essentially non-productive site for a period of more than 50 years. Productivity on these areas range from 0 to 40 percent of natural background. Forest Plan Standard SWST03 requires, in an activity area where existing conditions of TSRC are below five percent of the area, management activities to leave the area in a condition of five percent or less TSRC following completion of the activities. The PNF activity area has existing conditions of TSRC at three percent. The BNF activity area has existing conditions of TSRC at one percent. For the PNF activity area the magnitude of impacts to soil resources as a result of the SGP would have a net increase in TSRC that would raise the post-SGP percent TSRC to above five percent under either action alternative (i.e., 17 percent under 2021 MMP, and up to 17 percent under the Johnson Creek Route Alternative).

**Detrimental Disturbance (DD)**

For this analysis (which is comparable among both action alternatives), existing DD within the transmission line ROW is estimated at eight percent. The DD activity area is the area within the transmission line ROW that would be subject to vegetation clearing only and is estimated at up to 500 acres. It is estimated that SGP-related vegetation clearing could initially result in DD as high as 16 percent of the ROW but would more likely be somewhere between 8 and 15 percent. Additionally, the Forest Service would require features designed to minimize DD impacts.

The magnitude of impacts from vegetation clearing potentially include detrimental soil displacement, compaction, and puddling on a conservative estimate of up to 75 acres (15 percent) within the ROW, which would be further reduced by the Forest Service-required mitigation measures that target DD.

**Quantity and Quality/Suitability of Reclamation Cover Materials**

The overall relatively poor quality of the soils at the SGP mine site (outside of valley bottom soils), the long-term stockpiling of growth media (GM) or soil bank material, and the high background concentrations of metals in soils would affect the quality and suitability of available reclamation cover materials. GM used for upland reclamation sites would mostly come from relatively poor upland soils. Overall, the majority of GM used would rate as poor or fair (per suitability criteria), due primarily to texture and coarse fragment content (Tetra Tech 2019). These challenges, coupled with the harsh winter climate (short growing season) and generally steep slopes of the area, would compound the present difficulties in growing and/or maintaining persistent vegetation cover over reclaimed areas. This is consistent with the mixed vegetative cover success of nearby reclaimed mining areas and the previous efforts by Perpetua and others at the mine site to establish self-sustaining cover on previously mined lands that have had some limited success. Additionally, there would be a 797,702 bank cubic yards GM deficit at the mine site according to the balance calculations in the Reclamation Closure Plan. This deficit may be partially met with the surplus of material obtained from the Burntlog Route or could be met through
additional composting of both on- and off-site soil amendments. Thus, there is presently some uncertainty regarding the specific source of material to meet the identified GM deficits under either action alternative. Under the 2021 MMP there would be approximately 278 acres of unreclaimed pits/highwalls. The Johnson Creek Route Alternative would be the same as the 2021 MMP for mine-site related components but would differ due to use of the Johnson Creek Route instead of the Burntlog Route. Because the Johnson Creek Route Alternative does not include GM recovery from the Burntlog Route, it would therefore not have any potential surplus to compensate for the GM deficit at the mine site.

However, Perpetua has committed to salvage the appropriate volume of GM and to create the volume of compost necessary as an amendment to provide suitable quality and quantity of the GM to cover the areas to be reclaimed. Perpetua has also committed to performance criteria tied to slope and soil stability, sediment, and vegetation cover, which would need to be met prior to release of a reclamation performance bond.

The naturally high background levels of trace metals at the mine site represents a challenge with regards to the suitability of GM and reclamation-related revegetation efforts. Perpetua’s proposed 3,000-ppm arsenic limit for suitable root zone material is high. The Forest Service would require limits on the GM for arsenic, mercury, and antimony, and would require a Sampling and Analysis Plan that would include in-situ screening of soils as well as laboratory testing.

Noise

The noise analysis conducted for the SGP examined impacts on 12 defined noise sensitive receivers (NSRs) that were selected based on their approximate location to sensitive areas. Nine of these NSRs had baseline ambient noise levels available, while three did not. Of these 12 NSRs, ten were evaluated for the noise impacts from the SGP, two sites were omitted (Sites 1 and 4). Site 1 represents ambient sound levels near the SGP, and Site 4 is not considered an NSR, but the sound levels measured at Site 4 represent ambient sound levels in adjacent wilderness areas. The ten sites were compared against their baseline ambient noise level, as well as the SGP-set noise threshold of 55 dBA to evaluate the environmental impact to humans, following the Noise Control Act of 1972 and EPAs guidance on ambient noise levels.

Both action alternatives would create some short-term periodic noise exceedance impacts at up to four or five NSRs during SGP, access road, and transmission line construction, depending on the alternative. Construction and/or upgrades of access roads (Burntlog Route and Johnson Creek Route) for either action alternative would impact areas of the FCRNRW – noise would gradually attenuate to not noticeable up to 1.5 miles into the wilderness. Differing impacts to the FCRNRW are due to the distance of the access road to the wilderness boundary – the 2021 MMP utilizing the Burntlog Route is the closest to the FCRNRW for the longest length compared to the Johnson Creek Route Alternative.

Most of the operational activities (i.e., road maintenance and off-site facilities) would produce long-term and periodic noise impacts. Access road traffic and maintenance for both action alternatives would impact some areas of the FCRNRW, with impacts diminishing with distance from the wilderness boundary. Impacts from operations would not extend as far into the wilderness area as they would during construction.
During closure activities, there would be short-term noise impacts from transmission line and access road decommissioning under both alternatives exceeding the baseline ambient noise level, but not the 55 dBA threshold. There would be no irreversible impacts; all noise would cease upon final closure and reclamation.

**Hazardous Materials**

Both action alternatives would include the use, storage, and transport of hazardous materials which, if released, could potentially affect human health and the environment. Hazardous materials to be used would include diesel fuel, gasoline, lubricants, antifreeze, other petroleum products, chemical reagents and reactants (including sodium cyanide and sulfuric acid), antimony concentrate, mercury containing residuals, lime, explosives, and other substances.

Duration of spill risk for both action alternatives would be long term as it would last throughout the life of the SGP. However, the duration of any single hazardous materials spill or release would be temporary (hours or days). A fuel or chemical spill at the SGP facilities would likely be readily contained and cleaned up without any release to the environment.

A spill outside of containment at the SGP site or in transportation would most likely involve liquid fuels or reagents. A small spill of a few gallons, or even tens of gallons, outside of secondary containment would be promptly contained and cleaned up according to the Spill Prevention Control and Countermeasures Plan.

A larger spill of fuel or oil outside of secondary containment would more likely occur in transportation of bulk shipments along public roads or one of the SGP access routes. The proposed controls of transportation of hazardous materials along the SGP access routes, and the availability of SGP spill response resources and trained responders suggest that a spill along the access routes would be promptly contained and cleaned up. However, depending on the amount of material released, the location of the release, weather conditions, and proximity to flowing streams, the impact of the event could be minor to major.

State and federal regulations, project controls, and emergency response procedures would be in place to reduce spill risk and the extent of potential spill impacts.

In general, the potential for a release of hazardous material from a truck accident would be controlled for both the Burntlog and Johnson Creek routes with the use of management practices such as pilot vehicles, speed restrictions, and requiring appropriate spill kits in trucks hauling hazardous materials and in pilot vehicles.

Both the Burntlog and Johnson Creek routes have segments that are exposed to landslides, rockfalls, and avalanches. These geohazards present along the road corridors could increase the potential for truck accidents resulting in spills of hazardous materials. The Burntlog Route has exposure to 26 landslides or rockfalls and 38 avalanche paths. The Johnson Creek Route has exposure to 45 landslides or rockfalls and 94 avalanche paths. The Johnson Creek Route thus may have higher potential for increased trucking accidents and greater spill risk from these geohazards.
Close proximity to surface water resources increases the potential consequences of a significant spill along the access routes. The Burntlog Route crosses 37 streams and includes 9 total miles that are within 0.5 mile of surface water resources. The Johnson Creek Route crosses 43 different streams and includes 27 miles that are within 0.5 mile of surface water resources, including several miles which parallel the fish-bearing East Fork SFSR and Johnson Creek waterways. Though the Burntlog Route includes a greater number of stream crossings, the Johnson Creek Route includes greater proximity to water resources. The potential consequences from significant trucking spills would thus be greater along the Johnson Creek Route.

**Surface Water and Groundwater Quantity**

The SGP would result in stream flow impacts under both action alternatives. Low flow would be reduced at some locations during some periods of the SGP operations up to 14 percent in the East Fork SFSR and up to 40 percent in Meadow Creek.

Dewatering of the pits would lower groundwater levels in the alluvial and bedrock formations during the mining and post closure periods and would reduce flows in local surface water streams that receive groundwater discharge. Additional seep and spring locations fed primarily by groundwater discharge from the dewatered aquifer may also observe flow reductions as an effect of dewatering.

The TSF and TSF Buttress proposed to be located in the Meadow Creek valley would lower groundwater levels and permanently remove six delineated wetland areas within the footprint of the TSF and TSF Buttress. The permanent reduction in local groundwater levels would be due to the installation of liner and cover systems over these facilities to inhibit meteoric recharge leaching through the mined materials. The cover systems placed over the Yellow Pine pit backfill and the Hangar Flats pit backfill would have a similar effect on groundwater levels at those locations.

**Surface Water and Groundwater Quality**

All action alternatives would include handling and storage of mineralized materials which could potentially leach major ions, total dissolved solids (TDS), and/or metals and could result in adverse impacts to surface water and/or groundwater chemistry. Mineralized materials that would be managed include ore, development rock, and newly generated tailings. Similarly, mineralized materials would be exposed in pit walls, also resulting in exposure to oxygen and water, and the potential for leaching. Several proposed activities, including storage of mineralized materials above engineered liners and/or below engineered covers, diversion of stormwater and surface water around the disposal locations, and movement of legacy mineralized materials (tailings) from their current locations to engineered disposal facilities, would reduce, but not eliminate, the potential for the release of leached chemicals to surface water and groundwater.

The analysis shows that remaining rock in pit walls and the development rock, deposited in the TSF Buttress and pit backfills, would be largely non-acid generating, but would be capable of leaching aluminum, antimony, arsenic, cadmium, copper, manganese, mercury, zinc, sulfate and TDS into surface water and groundwater in concentrations that exceed water quality criteria. Therefore, active contact water collection and water treatment would be required for a period of time during the operations and post-closure period until geochemical stability of mined materials could be achieved. In the case of the
TSF where stabilization would depend on consolidation of tailings plus liner and cover installations over the tailings, this collection period would be approximately 40 years. The water treatment would prevent mine-impacted waters with elevated analyte concentrations from contacting surface water in the environment. Upon closure, inundation of development rock placed in pit backfills would result in analyte leaching from the backfilled material to alluvial and bedrock groundwater. However, this leaching would not materially affect the utilization of groundwater compared to its existing condition where it frequently does not meet water quality criteria except for an area where antimony and arsenic concentrations are below groundwater standards.

Surface waters also would be impacted by modification of temperature due to removal of shading vegetation, development of pit lakes, and modification of stream depth during construction, operations, or the post closure/reclamation period. Compared to existing conditions, project operations are predicted to increase temperatures in West End Creek and the East Fork SFSR below the Yellow Pine pit area. Upon closure activities, Meadow Creek temperatures are predicted to increase as the stream channel is restored atop the TSF while formation of the West End pit lake raises temperatures in West End Creek. With the exception of the West End Creek segment below the pit area, predicted temperatures return to existing conditions over a period of approximately 100 years.

Surface water quality also could be impacted by increased sedimentation associated with mining activities, access road construction and use, and the construction and maintenance of required utilities, with the greatest potential for in-stream impacts occurring during times of higher overland flow. The effect to surface water quality as a result of sedimentation and erosion would be limited by environmental protection measures and control techniques, by the limited duration of active surface disturbing activities, and by the adaptability of the receiving environment.

However, under existing conditions, streams in the SGP area (except for West End Creek) are listed as impaired for specific uses in accordance with Clean Water Act Section 303(d). The causes for listing of these waters are associated with arsenic (plus antimony and mercury at some locations) for exceedances of Idaho's human health criterion for consumption of water and organisms. Operational and post-closure concentrations of these elements in the East Fork SFSR are predicted to be comparable to or less than the existing conditions.

Groundwater analyte concentrations beneath the mine site, particularly in the vicinity of the TSF, TSF Buttress, Hangar Flats pit backfill, and Yellow Pine pit backfill, are expected to increase in response to constituent leaching from development rock. However, existing groundwater in those areas typically does not meet regulatory criteria for use as drinking water due primarily to arsenic and antimony concentrations.

There are no active domestic groundwater wells used for residential drinking water within 15 miles of the SGP. Because groundwater is not currently used as a public drinking water source at the SGP and is assumed to be unlikely to be used as a drinking water source in the future, the Agency for Toxic Substances and Disease Registry Public Health Assessment conducted for the existing mine site eliminated the groundwater as drinking water pathway from consideration as a public health concern (ATSDR 2003). With regard to wetland and riparian areas, changes to water quality parameters would occur under the 2021 MMP during the construction and operation phases. The 2021 MMP would improve...
some of the existing water quality conditions observed in Meadow Creek and the East Fork SFSR by removing and repurposing legacy mine wastes. However, the 2021 MMP would have direct permanent impacts on water quality, as it would contribute new sources of mine waste material to the East Fork SFSR drainage.

Despite analysis area improvements to water quality as a result of the removal and reclamation of legacy mine wastes, exceedances of the most stringent water quality standards (including both human health and aquatic life) for water column antimony, arsenic, copper, and mercury are anticipated. In considering only the aquatic life criteria, which are more relevant for the protection of fish species, impacts due to antimony and arsenic are not anticipated. For copper and mercury, impacts may be minimal but uncertainties in predicting future conditions exist.

**Vegetation**

Overall, the 2021 MMP-related vegetation clearing would impact 3,564 acres, including primarily undisturbed areas for the Burntlog Route where an increase in the potential for non-native plant establishment and spread would be more deleterious. The Johnson Creek Route Alternative would impact 3,399 acres through vegetation clearing; however, much of the disturbance area would be along or near previously disturbed areas (i.e., existing roads) where non-native plants are already established or could become established as a result of previously authorized activities.

The 2021 MMP would remove an estimated 259 acres of occupied whitebark pine habitat (12.5% of occupied habitat in the analysis area), totaling 1,236 trees (23 would be mature, cone-bearing). Impacts to the whitebark pine would be less under the Johnson Creek Route Alternative as an estimated 108 acres of occupied whitebark pine habitat (5.2% of occupied habitat in the analysis area), totaling an estimated 767 trees (23 would be mature, cone-bearing trees) would be removed.

The 2021 MMP would impact known occurrences of bent-flowered milkvetch, least moonwort, Sacajawea’s bitterroot, Blandow’s helodium, sweetgrass, and Rannoch-rush, while the Johnson Creek Route Alternative would impact known occurrences of bent-flowered milkvetch, least moonwort, and Sacajawea’s bitterroot. Additionally, the 2021 MMP would impact a greater amount of modeled potential habitat (3,991 acres) for sensitive and forest watch plant species than the Johnson Creek Route Alternative (3,204 acres).

Impacts as a result of increased potential for non-native plant establishment and spread may be regional in nature due to the relatively large amount of habitat disturbance associated with the 2021 MMP and Johnson Creek Route Alternative.

**Wetland and Riparian Areas**

**Loss of Wetland and Riparian Areas**

**Mine Site Focus Area**

The 2021 MMP and the Johnson Creek Route Alternative would result in the same loss of 120 wetland acres within the mine site focus area (approximately 28 percent of the 429 total acres of wetlands within the SGP analysis area) and 619 acres of riparian areas.
**Off-Site Focus Area**

Wetlands and riparian areas in the off-site focus area would be impacted by the action alternatives. The off-site area includes features such as Big Creek - North Fork Payette River, Cascade Reservoir, Gold Fork River, Johnson Creek, Lake Fork - North Fork Payette River, Headwaters East Fork SFSR, and Upper South Fork Salmon River.

Losses of wetlands due to the 2021 MMP in this area would be 76.3 acres and the Johnson Creek Alternative would result in the loss of 71.2 acres. Perennial stream lengths affected would be 4.44 miles for the 2021 MMP and 4.14 miles for the Johnson Creek Alternative and lengths of non-perennial streams impacts would be 2.78 miles and 2.23 miles, respectively. Riparian area losses would be 300 acres for the 2021 MMP and 353 acres for the Johnson Creek Route Alternative. Differences of impacts to wetland and riparian acreages outside the mine site focus area are predominantly due to the absence of the Burntlog Route disturbance under the Johnson Creek Route Alternative.

**Impacts on Wetland and Riparian Functions**

The losses of wetland functional units by action alternative would be 1,054 for the 2021 MMP and 1,028 for the Johnson Creek Route Alternative with 376 and 371, respectively of these functional units attributed to Category II wetlands (high value) and the rest Category III and IV.

**Alteration of Wetland and Riparian Areas due to changes in Water Balance**

Impacts due to groundwater drawdown would be the same for both alternatives since construction, operation, and reclamation activities would be the same within the mine site focus area. The action alternatives may vary in indirect effects due to roads, but those indirect effects have not been quantified. However, given the small amount of wetlands affected in the off-site focus area relative to the mine site focus area, the differences between the two action alternatives would be minimal.

**Alteration of Wetland and Riparian Areas due to Changes in Water Quality**

Both action alternatives would have direct permanent impacts on water quality due to contributions of new sources of mine waste material to the East Fork SFSR drainage. Indirect effects to wetlands and riparian areas could occur if the quantity and or quality of surface and groundwater flows, including the chemical characteristics of the waters, change downstream of disturbance areas. Removal and repurposing of legacy mine wastes would occur under both action alternatives, thereby improving some existing water quality conditions observed in Meadow Creek and the East Fork SFSR.

Under the Johnson Creek Route Alternative, water quality effects on wetlands and riparian areas would be similar as described under the 2021 MMP, although the absence of construction or use of the Burntlog Route would eliminate water quality impacts in this area as compared to the 2021 MMP. As the Johnson Creek Route is parallel and near Johnson Creek and the East Fork SFSR along much of its route, these effects would be concentrated in these streams, whereas the Burntlog Route would cross several drainages resulting in less impact on any one drainage.

**Compensatory Mitigation for Losses of Aquatic Resources**

In order for the USACE to issue a permit under Section 404 of the CWA and authorize dredge or fill placement in WOTUS, all unavoidable impacts to jurisdictional WOTUS must be mitigated. The final rule for Compensatory Mitigation for Losses of Aquatic Resources (U.S. Environmental Protection Agency and USACE 2008) states a preference for achieving mitigation by first trying to find available.
wetland mitigation credits from an agency-approved wetland mitigation bank. When mitigation bank credits are not available, the final rule directs 404 permit applicants to seek out opportunities to use in-lieu fee programs to satisfy mitigation needs. In-lieu fee programs are generally operated by public resource agencies that accept money for wetland impacts within a specific geography and periodically use that money to fund wetland restoration, creation, or enhancement projects within that same geography. Perpetua proposes to accomplish compensatory mitigation for impacts to wetlands through a combination of mitigation bank credits in the North Fork Payette subbasin and permittee-responsible on-site mitigation within the SFSR subbasin (Tetra Tech 2021b).

**Fish Resources and Fish Habitat**

For fish and aquatic habitat, the important factors involve the removal and placement of barriers such as the Yellow Pine pit and TSF/TSF Buttress (which affect species differently), the modifications in surface water management and flows at the mine site, fish access through the East Fork SFSR tunnel, and stream channel restoration effects on stream temperature. The principal difference between alternatives is associated with the risk of transportation-related spills along access routes. Under the 2021 MMP, during construction, 6.5 miles of the transportation route would be within 100 feet of streams but would be reduced to 1.69 miles of route within 100 feet of streams once the Burntlog Route was constructed. The Johnson Creek Route Alternative would have 6.5 miles of transportation route within 100 feet of streams for the duration of the SGP.

Reclamation and stream restoration activities post-closure generally improve habitat conditions compared to the operational period as flows and channels are re-established. However, stream temperatures are increased in restored stream channels until revegetation establishes to provide riparian shading for the streams.

Individual fish would be affected by dewatering, salvage, and relocation due to modification of stream channels and dewatering of the existing Yellow Pine pit lake. Fish salvage would be required for dewatering and all in-water work at stream crossings in all fish-bearing water bodies. Management of individuals affected would be conducted under the Fisheries and Aquatic Resources Mitigation Plan and Fishway Operations Management Plan.

Alterations to mine area surface streams including the elimination of the Yellow Pine pit lake, construction of the East Fork SFSR fish tunnel, and removal of existing barriers would alter fish occupancy and available habitat during construction and operations primarily by allowing fish access to portions of the East Fork SFSR and relocating the barrier on Meadow Creek upstream.

During operations summer maximum stream water temperatures in Meadow Creek and the East Fork South Fork would decrease due to diversion of Meadow Creek around the TSF and TSF Buttress. Upon closure and routing of Meadow Creek to the restored stream channel on top of the reclaimed TSF, summer maximum stream temperatures would increase due to the time needed for revegetation to result in riparian shading of the stream. Over time, summer maximum stream temperatures would decline to near or below baseline conditions.

Changes in water chemistry due to mining activities would not negatively affect fish because predicted concentrations for key constituents are comparable or lower than existing conditions. Effects of spills,
sedimentation, and turbidity on water quality would be managed through Forest Service requirements and project design features to minimize these effects.

Stream flow reductions would affect fish productivity during operations, but productivity would return toward existing conditions as stream flows recover over time. Post-closure stream flows and productivity would decrease in Meadow Creek and the East Fork SFSR upstream from Meadow Creek by 1 percent and 2 percent, respectively due to hydrological and physical changes associated with the project. Flows and productivity in the East Fork SFSR downstream from Meadow Creek would return to existing conditions post-closure.

The combination of physical stream channel changes, direct effects to individuals, and changes to many of the WCIs (e.g., temperature, stream flow) would affect Chinook salmon and habitat in the analysis area. SGP activities that would potentially cause these impacts include, but are not limited to, new road construction, transportation including hazardous materials, stream diversions, and construction and operation activities at the mine site. These effects may cause injury or mortality to individuals and temporarily or permanently displace Chinook salmon from several mine site streams during certain periods when habitat conditions become unsuitable. This would cause a temporal loss of habitat. Following closure and reclamation, the overall net effect from the SGP would be a net increase in available habitat; however, flows and temperatures make the additional habitat less optimal.

There would be similar operational period effects on steelhead trout, bull trout, and westslope cutthroat trout. Effects for trout species differ from Chinook salmon following closure and reclamation, as there would be a net increase in both the quantity and quality of habitat for steelhead trout and net decreases in both quantity and quality of habitat for bullhead trout and westslope cutthroat trout.

**Wildlife**

The 2021 MMP and Johnson Creek Route Alternative would remove an estimated 3,266 acres and 3,096 acres, respectively, of wildlife habitat, including habitat for Canada lynx (194 and 175 acres, respectively), wolverine (2,342 and 2,005 acres, respectively), northern Idaho ground squirrel (63 acres), Monarch butterfly, Region 4 sensitive species and management indicator species, Idaho species of greatest conservation concern, general wildlife species, big game species, and migratory bird species and bald and golden eagles.

Direct impacts to wildlife species may include direct mortality (i.e., wildlife-vehicle collisions, removal of nest or roost trees, etc.) or loss of habitat due to land clearing activities and land use changes. Indirect impacts could include reduced use of foraging or breeding habitat or reduced prey resources in the analysis area.

Within the Operations Area Boundary, direct effects on wildlife species would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, fugitive dust, and increased human activity under the 2021 MMP and Johnson Creek Route Alternative. Wildlife would likely be displaced around the perimeter of the mine site. Additional roadways in the Operations Area Boundary would expose individuals to direct vehicle collisions or increased hunting pressure from humans in the wildlife analysis area. Light, noise, and fugitive dust impacts associated with mine site activities are likely to disturb or displace wildlife species. However,
because the existing (ambient) sound levels vary between 20 and 40 dBA, it is likely that SGP area wildlife would have a higher tolerance for noise. Equipment would have limited external lighting and would employ noise-minimizing practices. As part of the SGP, buildings, equipment, and drill rigs would have limited external lighting when feasible. The result would generally be a reduction in the area of habitat disturbed at most sites.

As a result of new access roads, limited to the 2021 MMP and not the Johnson Creek Route Alternative, direct effects on wildlife species would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, fugitive dust, and increased human activity. Construction of 15 miles of new road for the Burntlog Route would likely fragment habitat for general wildlife species and may act as a barrier to movement for some species. The intensity of this impact could range from minor displacement to mortality. The duration ranges from temporary road construction to short-term. It is not expected that the increased risk of injury or mortality would become permanent, because the new segment of the Burntlog Route would be reclaimed, and traffic levels on the existing roads would return to current levels.

Regarding utilities, direct impacts on wildlife species may include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes under the 2021 MMP and Johnson Creek Route Alternative. The addition of new utility access roads, as well as new transmission lines, and upgraded transmission lines, could impact individual wildlife species. Construction impacts would likely displace wildlife but would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP and Johnson Creek Route Alternative activities to preserve natural habitat to the greatest extent practicable. However, impacts to forested wetlands would likely be permanent as ROW management practices generally do not allow the establishment of woody vegetation.

Construction and operation of the off-site facilities under the 2021 MMP and Johnson Creek Route Alternative are unlikely to disturb most wildlife species, because construction activities are not planned to occur in suitable habitat used by them. Although construction and operation of the off-site facilities themselves would likely not cause direct mortality to wildlife species, vehicle traffic associated with the facilities could result in mortality.

The important differences among the alternatives lie in the acres of habitat loss, the amount and location of the disturbance from noise and human activity, new access roads, and the location of the facilities. The Johnson Creek Route Alternative would have 170 fewer acres than the 2021 MMP due to the elimination of the Burntlog Route which also would reduce the magnitude and extent of impacts on most wildlife, especially wolverine, big game, and migratory birds. However, under both alternatives, greater impacts would occur for several groups of wildlife (e.g., big game [moderate impacts] and wolverine [major impacts]) due the species known occurrences and location and amount of habitat disturbance associated with the SGP.
Timber Resources

The 2021 MMP would result in vegetation clearing on 595 acres containing 438,243 cubic feet of sawtimber and sub-merchantable product, while the Johnson Creek Route Alternative would result in vegetation clearing on 733 acres containing 547,984 cubic feet of sawtimber and sub-merchantable product. Permanent impacts under the 2021 MMP would occur on 66 acres containing 12 acres of land suited for timber production in Management Prescription Categories (MPCs) 5.1 and 4.2, with approximately 206 million board feet (MBF) of sawtimber. The Johnson Creek Route Alternative would result in permanent impacts to 282 acres in the analysis area that contain 28 acres of land suited for timber production in MPCs 5.1 and 4.2, with approximately 808 MBF.

To address the loss of timber resources within the timber resources analysis area, 111 acres would be replanted during reclamation with conifer and other tree species under the 2021 MMP and Johnson Creek Route Alternative. Areas identified for timber species replanting are entirely within the mine site, where lands would either be treated to regenerate forest conditions (planted at 81 trees per acre) or park-like conditions (planted at 170 trees per acre) under two conditions: cool aspect and general aspect. Planted timber species would include primarily Douglas-fir and lodgepole pine, with the inclusion of Engelman spruce on the cool-aspect sites.

Land Use and Land Management

The SGP would primarily occupy National Forest System (NFS)-managed lands, with the majority of impacts on PNF lands. Land use would be impacted by expansion of the mine site and associated mining activities and facilities (access roads, utilities, and off-site facilities). Other land uses (agriculture, fisheries, timber harvests, tribal, and recreational and special uses) would be impacted by the conversion of land to mine uses. These impacts are described in other resource sections within this SDEIS. Table ES-2 shows the total acreage impacts from each mine component that would result from each action alternative.

Either action alternative would require new mine or related infrastructure to be built on previously undisturbed private, state, NFS, and Bureau of Reclamation lands. Table ES-3 shows the acreage of impacts from the mine components by action alternative.

Table ES-2 Total Mine Component Acreage Impacts

<table>
<thead>
<tr>
<th>Mine Component</th>
<th>2021 MMP (acres)</th>
<th>Johnson Creek Route Alternative (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
<td>1,740</td>
<td>1,728</td>
</tr>
<tr>
<td>Access Roads</td>
<td>485</td>
<td>328</td>
</tr>
<tr>
<td>Utilities</td>
<td>1,012</td>
<td>1,011</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Total¹</td>
<td>3,266</td>
<td>3,095</td>
</tr>
</tbody>
</table>

¹ Subtotals may not add to totals due to rounding.
Table ES-3  Mine Component Acreage Impacts on Previously Undisturbed Land

<table>
<thead>
<tr>
<th>Mine Component</th>
<th>2021 MMP (acres)</th>
<th>Johnson Creek Route Alternative (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
<td>881</td>
<td>876</td>
</tr>
<tr>
<td>Access Roads</td>
<td>341</td>
<td>217</td>
</tr>
<tr>
<td>Utilities</td>
<td>422</td>
<td>422</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>Total 1</td>
<td>1,674</td>
<td>1,544</td>
</tr>
</tbody>
</table>

1 Subtotals may not add to totals due to rounding.

The action alternatives would require new ROWs or easements to accommodate the construction of new and upgraded access roads and transmission lines. These impacts would be located on private, state, and NFS lands; new transmission line ROW would not cross any Bureau of Reclamation lands for either action alternative. New ROWs on NFS lands are considered a direct effect to land use and may be authorized under Forest Service special uses regulations at 36 CFR 251 or under 36 CFR 228A depending on the type of use, location, and other factors. For purposes of this environmental analysis, the agency is assuming the proposed uses would be able to be authorized under existing regulatory authorities. However, the agency will need to evaluate the eventual applications for rights of way to make a final determination. ROW authorizations on private lands in Valley County would require a conditional use permit, and ROW authorizations on lands owned by the State of Idaho would require coordination with IDL. Table ES-4 provides the acreage of new ROW required for each alternative.

Table ES-4  New Acres of ROW Required by Alternative

<table>
<thead>
<tr>
<th>New ROW</th>
<th>2021 MMP (acres)</th>
<th>Johnson Creek Route Alternative (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>341</td>
<td>217</td>
</tr>
<tr>
<td>Transmission Lines</td>
<td>422</td>
<td>422</td>
</tr>
<tr>
<td>Total 1</td>
<td>763</td>
<td>639</td>
</tr>
</tbody>
</table>

1 Subtotals may not add to totals due to rounding.

Access and Transportation

Traffic Volumes

During construction, mine traffic under the 2021 MMP and Johnson Creek Route Alternative would generate an estimated annual average daily traffic (AADT) of 65 vehicles (45 heavy vehicles and 20 light vehicles). Construction traffic volumes on Johnson Creek Road and Stibnite Road would almost double and triple, respectively. Over a third of the vehicles traveling on these one-lane, native surfaced roads would be comprised of heavy vehicles and could result in slower travel times for non-mine-related traffic and may deter other travelers from using these roadways. Travelers may use alternative roadways including McCall-Stibnite Road to South Fork Salmon River Road.
During operations, mine-related traffic would include transport of employees to and from the SGP, delivery of supplies, and activities associated with road maintenance such as snowplowing and sanding. Under the 2021 MMP and the Johnson Creek Route Alternative, operational AADT would be 50 vehicles (33 heavy vehicles and 17 light vehicles), resulting in approximately four mine-related vehicles per hour traveling outside the SGP.

The upgraded Burnt Log Road and the newly constructed Burntlog Route would experience an increase in traffic of over 71 percent under the 2021 MMP, with 27.5 percent of the traffic comprised of heavy vehicles. Although heavy vehicles currently use Johnson Creek Route to access the SGP, the Johnson Creek Route Alternative traffic would result in a noticeable change in baseline driver experience and slower drive times due to the substantial increase in mine-related heavy vehicles along the Johnson Creek Route during the life of the SGP. Even though upgrades to Johnson Creek Road and Stibnite Road would be made, these roads would still have many curves and slopes.

During closure and reclamation, activities including slope recontouring, facility removal, seeding and planting, and post-closure environmental monitoring would require approximately 7 years. Closure and reclamation would generate a total estimated AADT of 27 vehicles (15 heavy vehicles and 12 light vehicles). Post-closure monitoring activities would generate a total estimated AADT of six light vehicles.

Local roads experience a seasonal effect which results in noticeable differences in traffic. Valley County has many summer recreational areas that attract visitors from May through October with peak AADT levels in June, July, and August. Mine access via the Johnson Creek Route would be more impactful on summer recreational traffic because it would utilize established roads rather than new road development. Winter driving conditions influence the amount of traffic and result in lower AADT levels during the winter months. Therefore, the effect of SGP traffic on these roads would show a noticeably greater increase in mine-related winter traffic during winter. Post-closure winter traffic would not be as noticeable as heavy vehicle deliveries would not occur and approximately six mine-related light vehicles per day would utilize the accessible roadways in the analysis area for monitoring and maintenance purposes.

Public Access
Under the 2021 MMP, public access to the SGP area would be enhanced by the development of a new access road (Burntlog Route) compliant with current road standards. Under both action alternatives, there would also be a controlled public access route through the SGP during the operations, and closure and reclamation phases; however, public access would be intermittently interrupted during the construction phase. Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed, and the Johnson Creek Route would be used for both public and SGP-related access. To continue providing OSV access to Landmark, a 10.4-mile groomed OSV route between Warm Lake and Trout Creek Campground on Cabin Creek Road would be created as part of the 2021 MMP along with a parking area, resulting in a new winter access facility that would be maintained by Valley County.

Safety and Emergency Access
For the duration of the SGP, the increase in total volume of mine-related vehicles, specifically heavy vehicles or trucks, on the Yellow Pine and Burntlog routes would result in an increased risk for accidents occurring between public and SGP-related traffic due to the one-lane constraints during construction, for
passing slower moving vehicles, and degradation of the road with more frequent heavy vehicle travel. Proposed controls for deliveries of hazardous materials would address the risk of accidents for those convoys. The steep terrain would be a greater risk to safety along the Johnson Creek Route under the Johnson Creek Route Alternative as it would be the only route used for the life of the SGP and would require safety considerations for geotechnical hazards, landslides, and avalanche zones, including intermittent and extended road closures during the four years of construction. Additionally, access into the SGP mine site under the Johnson Creek Route Alternative would be through a single point of ingress and egress and would require additional safety considerations for mine deliveries and public access. The steep climb to provide access around the Yellow Pine pit would require a wider road with more switchbacks to accommodate the heavy trucks transporting mine supplies and may increase hazardous driving conditions for crew rotation, emergency responses, and wildfire evacuation.

**Other Modes of Transportation**

Under both action alternatives, a helipad would be located at the SGP for exploration during daylight hours, Medevac purposes, and avalanche control activities. Approximately one round trip (two truck trips) of antimony concentrate would be hauled off-site daily. The daily shipment of antimony and the potential transport of supplies and materials to and from the SGP would generate minimal to negligible changes in regional water transportation. Although there is no commercial rail transportation system in the analysis area, there is potential for the trucks to transport mine products to rail lines located in Boise or for supplies and materials to be indirectly transported to and from the SGP by trucks originating from rail shipments. Nevertheless, these impacts would generate negligible changes to rail transport during operation of the SGP and would not substantially alter the regional level of service.

**Heritage Resources**

There are 143 potential historic properties (NRHP-eligible or unevaluated heritage resources) within the areas of potential effects (APEs). Adverse effects have been identified for up to six historic properties, depending on the action alternative. Adverse effects to additional historic properties could occur, although historic properties within the transmission line footprint and access road construction footprint could potentially be avoided.

There is an undisclosed number of potential Traditional Cultural Properties (TCPs) and Cultural Landscapes (CLs). The Forest Service is in ongoing consultation with the Nez Perce Tribe, Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes to determine what protected information can be made public.

One historic property is located at the SGP (Site 10VY1488, the Stibnite Lithic site). This archaeological site would be adversely impacted under either action alternative due to construction impacts associated with the transmission line. Impacts could be minimized or avoided through redesign in this area.

Two historic properties (Old Thunder Mountain Road [FR 440] and IPCo Line 328) are linear sites that pass through and beyond the analysis area. No adverse effect would occur to the IPCo Line 328 under the 2021 MMP or the Johnson Creek Route Alternative. Under the 2021 MMP, the Burntlog Route would overlap about 2 miles of the 25-mile long Old Thunder Mountain Road. Old Thunder Mountain Road is currently part of FR 440 (an all-terrain vehicle road) and would not be realigned by the SGP. Therefore, no adverse effect would occur.
Three of the six historic properties are Forest Service administrative buildings (Landmark Ranger Station, Meadow Creek Lookout, and Thunderbolt Lookout). Under the Johnson Creek Route Alternative, the Johnson Creek Road would be upgraded in the area of the Landmark Ranger Station and used for mine access for the life of the SGP; although physical disturbance to the historic property would be avoided, there could be visual, noise, and vibratory impacts to its integrity from the Landmark Maintenance Facility constructed within its viewshed and increased noise and vibration due to increased traffic including heavy vehicles on the Johnson Creek Road. Effects to the Landmark Ranger Station would be minimal under the 2021 MMP because the road would not be improved and would only be utilized during construction of the SGP. At the Meadow Creek Lookout, a new VHF repeater site would be constructed. Addition of this equipment to the setting would cause an adverse effect under the 2021 MMP, as this would only be needed for the Burntlog Route. The Thunderbolt Mountain Lookout, a potential historic property that has not been formally inventoried, would be subject to similar impacts.

The introduction of visual elements would alter the integrity of setting, feeling, and/or association of certain historic properties. Under both action alternatives, the Stibnite Lithic Site and the Meadow Creek Lookout would be subject to altered viewsheds. The Johnson Creek Route Alternative’s Landmark Maintenance Facility would alter the Landmark Ranger Station’s viewshed. Under either action alternative, effects from increased visual intrusions also are of concern for TCPs or CLs that could be present in the APE.

The potential impact for noise is the same for either action alternative. Noise levels higher than ambient also could affect use of TCPs or CLs by creating a distraction and altering the sense of solitude and feeling of the natural environment.

Ground disturbance totals vary between the action alternatives. The 2021 MMP would disturb 3,266 acres, while the Johnson Creek Route Alternative would disturb 3,095 acres. In general, reduced ground disturbance lowers the potential for impacts and for inadvertent cultural resources discoveries during construction.

In summary, potential impacts to historic properties caused by ground disturbance, the introduction of new visual elements, and/or noise and vibration disturbances do not vary substantially between the action alternatives. Physical impacts would affect, at a minimum, between five (2021 MMP) and six (Johnson Creek Route Alternative) historic properties that include the Landmark Ranger Station, Meadow Creek Lookout, Thunderbolt Lookout, IPCo Line 328, a historic road/Native American travel corridor (Old Thunder Mountain Road), and the Stibnite Lithic site. Visual impacts could adversely affect four to five historic properties that include the lookouts, the ranger station, and the Stibnite Lithic site.

If avoidance of other historic properties along other SGP components such as the transmission line and off-site facilities cannot be avoided by construction, then additional impacts would occur. Under the 2021 MMP, 46 historic properties would be within the physical APE and an additional 97 historic properties within the visual, auditory, and vibratory (VAV) APE. Of those there is potential for 19 to have physical impacts, 68 could experience visual effects, 15 that may be susceptible to vibratory effects, and 16 whose integrity could be affected by noise.
Under the Johnson Creek Alternative, 44 historic properties would be within the physical APE and an additional 86 historic properties within the VAV APE. Of those there is potential for 18 to have physical impacts, 66 could experience visual effects, 14 that may be susceptible to vibratory effects, and 15 whose integrity could be affected by noise.

All of these types of impacts, as well as access restrictions caused by the SGP for a period of 20 years, could affect integrity of TCPs and CLs and the ability of tribes to access these resources under both action alternatives.

The potential indirect effects from possible future increased access to the analysis area due to additional and upgraded roads is generally the same under either action alternative. Traffic may increase over current use, and this could possibly create an indirect effect to heritage resources by making them more visible and more vulnerable to damage or vandalism.

Any areas within the physical APE proposed for disturbance that have not been surveyed would be inventoried prior to SGP-related ground disturbing activities that may impact historic properties in accordance with stipulations in the Programmatic Agreement. The agreement also would include provisions for identifying TCPs and CLs prior to ground disturbance associated with the SGP. Additionally, it would identify mitigation measures for historic properties and how the Forest Service would ensure that they are carried out.

**Public Health and Safety**

Potential public health and safety impacts (both positive and negative) were evaluated. These effects would be primarily related to alterations of environmental conditions, economic conditions, local public services, and infrastructure. Removal of legacy mine materials along with regulatory requirements and project design features minimizes effects associated with air quality, soil quality and water quality resulting from changing environmental conditions.

Associated with changes in economic conditions, there would be greater exposure to natural hazards such as avalanches due to the increase in the number of people traveling and working in the area. Further, economic dislocation and disruption to the local area economy after cessation of mine operations (“boom and bust” impacts) may occur but may be somewhat offset by the residual positive impacts of SGP operations on socioeconomic conditions.

Public services and infrastructure would be affected by increased use during construction and operations but would benefit from improvements to roads and access plus upgrades to electrical power utilities. Emergency medical technicians and emergency equipment and supplies would be on-site, including an ambulance, first aid, and medical supplies. These facilities would minimize the demand on the local services and provide medical services for workers and site-visitors in an otherwise remote area. However, with 500 or more employees living and dining in relatively close quarters, the potential for transmission of infectious diseases exists. Employees from the local community who lodge at the on-site facility could potentially transmit infectious diseases to the local communities upon return from the on-site housing facility. Therefore, worker safety protocols include basic measures for good hygiene and protection of infectious disease transmission; and on-site health care services would provide basic treatments for worker illnesses.
Recreation

Both action alternatives would result in impacts to recreation access, settings, opportunities, use, facilities, and recreation-related special use permits. The SGP would remove the mine area from recreation use and alter the recreation setting in the surrounding area due to visual changes and noise. Use of Warm Lake Road (CR 10-579) and the Johnson Creek Route during construction would affect access and the recreation setting for facilities along Johnson Creek and Warm Lake Roads. Winter plowing of Johnson Creek Road (CR 10-413) during construction would affect access to other OSV routes. New winter motorized access would be provided on the Cabin Creek Road OSV route. Construction of many SGP facilities may have temporary impacts to recreation (access, opportunities, use) and may alter the recreation setting of the areas within and adjacent to these facilities. The SGP also would affect access to operating areas of three outfitters and guides, affect their ability to provide activities, and may degrade customer’s recreation experiences.

Under both action alternatives, temporary closure of the connection between the Stibnite and Thunder Mountain roads through the SGP would affect access and use of sites off these roads until the connecting route through the SGP was constructed. Road access through the SGP would provide controlled access to the Thunder Mountain Road area for the public and permitted outfitters.

The Burntlog Route under the 2021 MMP would offer new motorized access where such access does not currently exist and could increase recreation use in areas surrounding these facilities. These facilities also may displace wildlife-based and non-motorized recreation opportunities and would alter the recreation setting for the FCRNRW and two dispersed camping areas. Due to its closeness to the FCRNRW border, a portion of the Burntlog Route would result in additional change to the recreation setting for wilderness activities, potentially induce increased use of the Black Lake area and FCRNRW, and potentially result in unauthorized motorized use of the FCRNRW. The Burntlog Route may have an increased impact on the ability of the two permitted outfitters to provide permitted activities due to the impacts on wilderness activities. The maintenance facility under the 2021 MMP would be located along the Burntlog Route, but construction noise may affect the Mud Lake dispersed camping area, which also would be affected by construction of the Burntlog Route.

The Burntlog Route would not be developed under the Johnson Creek Route Alternative. Therefore, there would be no adverse or beneficial impacts to recreation from this route compared to the 2021 MMP. Instead, the Johnson Creek Route would be used during all phases of the SGP. Construction impacts of using the Johnson Creek Route under the Johnson Creek Route Alternative would be similar to the 2021 MMP, except periodic temporary closures on Johnson Creek Road and daily closures on Stibnite Road would result in reduced access and recreation opportunities and impacts to visitor experiences along Johnson Creek, Stibnite, and Thunder Mountain Roads and locations accessed from these roads, potentially including the Big Creek area depending on where the closure would be located along Stibnite Road. Construction would also take two years longer for the Johnson Creek Route Alternative.

Unlike the 2021 MMP, impacts from use of the Johnson Creek Route under the Johnson Creek Route Alternative would continue through operations and closure/reclamation instead of ending once the Burntlog Route was completed (except for impacts from road closures as these would not occur during operations or closure/reclamation). The maintenance facility would be located at Landmark, increasing recreation impacts in that area. Under the 2021 MMP, impacts to recreation in the winter from the...
Johnson Creek Route would be similar to the 2021 MMP, except plowing of Johnson Creek Road and grooming of the OSV route along Johnson Creek Road would continue through closure and reclamation. In addition, under the Johnson Creek Route Alternative, the Johnson Creek OSV route would be longer (up to Wapiti Meadow Ranch). After reclamation under the Johnson Creek Route Alternative, Stibnite Road improvements would remain and could increase access for more vehicles and affect the recreation setting.

**Scenic Resources**

**Change in Landscape Character and Scenic Quality of the Analysis Area**

The action alternatives would cause similar changes to local landscape scenic qualities over the construction, operation, and closure and reclamation timeframes. The No Action Alternative would result in no change to landscape character and scenic quality. The 2021 MMP would result in the greatest change in landscape character and scenic quality, primarily due to construction and operation of the Burntlog Route in addition to the SGP mine site. The Johnson Creek Route Alternative would entail less change to landscape character and scenic quality of the analysis, as the mine access route would not require construction of the Burntlog Route. After operations, new portions of the Burntlog Route would be decommissioned, and visual impacts would lessen over time.

**Change in Distance Zone**

The 2021 MMP would result in the greatest change to distance zones, because it would require construction of a new roadway in the forest. Individuals traveling through the forest on the new roadway would be able to see areas of the forest either not seen from viewing platforms under existing conditions or see them from a closer distance. The 2021 MMP would add the largest amount of new access roads. Under the 2021 MMP, the SGP would be in the middleground distance zone of the new roadway for approximately 2 miles. Both alternatives would involve construction of the new Thunder Mountain Road link that would traverse through the SGP providing immediate foreground views of the SGP.

**Change in Nighttime Lighting**

Nighttime lighting at the SGP would be the same for both action alternatives. Similarly, there would be nighttime lighting effects from vehicles traveling on roads (new or improved) under both action alternatives. The 2021 MMP would include the greatest mileage of new roadway, but some of these would occur at higher elevations, potentially increasing distant visibility. The Johnson Creek Route Alternative would not include construction of Burntlog Route, but nighttime lighting effects would increase along the Johnson Creek Route, which potentially has more viewers to experience them as there are residences in the village of Yellow Pine and ranches along Johnson Creek Road (CR 10-413).

**Context of Impacts per Forest Guideline Visual Quality Objectives**

Under both action alternatives, the SGP, access routes, new and upgraded transmission lines, and off-site facilities would introduce moderate to major levels of visual contrast to areas with local and regional scenic importance as indicated by Preservation, Retention, and Partial Retention Visual Quality Objectives (VQOs) and in certain areas would be in conflict with established Forest Service VQOs.

**Changes to Scenic Integrity**

The analysis area generally has moderate scenic integrity because the landscape is altered by existing roads and transmission lines. Scenic integrity is low where existing disturbances are present from
historical mining activities. Under both action alternatives, additional alterations would occur to the already impacted SGP area during construction and operations. After closure and reclamation, the scenic integrity at the SGP would slowly improve. Access roads under the 2021 MMP would cause similar degradations to scenic integrity caused by the construction of and activities on the Burntlog Route. Under the Johnson Creek Route Alternative, the change to scenic integrity would be less evident, because existing roadways would be improved rather than new roadway segments built. However, as there are residences along the existing Johnson Creek Route, there may be more viewers to experience these changes.

Social and Economic

Construction and operation of the SGP would provide jobs and income for both individuals directly employed for the SGP, as well as for other individuals whose employment and incomes would be indirectly or induced by SGP’s activities. Most of these employment and income impacts would support Idaho residents, of which a portion would be Valley and Adams counties residents. Given the local area’s population and current low unemployment conditions, the SGP would result in an in-migration of up to 200 individuals and another 230 dependents for SGP-related employment opportunities. Project-related employment opportunities would have the potential to affect the labor supply for other local employers needing to backfill open positions.

The potential for socioeconomic impacts to the local area’s economy and social conditions would primarily result from the new in-migrant population. The potential influx of new residents (especially those that would be non-SGP employees) may increase the demand and supply of housing and housing affordability within the local area. Other in-migration effects would include potential impacts on school enrollment, telecommunications, infrastructure, government services, and transportation. It also is expected that there could be potential for “boom and bust” impacts on the local area economy if there are insufficient alternative employment opportunities when SGP operations end.

Compared to the 2021 MMP, the Johnson Creek Route Alternative would have substantial increased construction and O&M costs. However, due to its longer construction period (five years instead of three years) and the operating phase’s extended duration, the Johnson Creek Route Alternative’s resulting socioeconomic impacts (i.e., employment, income, population, housing, public services, and government revenue impacts) would be expected to be marginally higher than those identified under the 2021 MMP.

The potential for other adverse impacts to the local area’s economy would be relatively limited. This is due to both the limited extent and remote location of SGP’s expected resource impacts. In addition, recreational opportunities would be available elsewhere in the analysis area for recreationists displaced by SGP’s activities. As a result, these other SGP-related impacts generally would not result in future visitation changes or other impacts to the local area’s overall economy but could affect specific outfitters’ access to the SGP area.

Once in operation, annual government tax revenue benefits from SGP operations are estimated to total $61.7 million. Perpetua is projected to pay $29.4 million in taxes annually. The other $32.3 million would be paid by SGP support businesses and employees. The federal government is expected to receive most of the total tax revenues resulting from operations. Federal tax receipts during the SGP operations phase are projected to be $51.6 million annually. The state and local tax revenues generated are projected to be
$10.1 million per year. Most of these taxes would be received by the State of Idaho. Local tax revenues paid by Perpetua are projected to average $0.3 million per year. Local property taxes may be used to fund local schools, local governments, local law enforcement, fire protection, local roads, and other public services. The extent that the SGP-related increase in state and local tax revenues would result in a net benefit to Valley County’s public services would depend on the extent that they offset increases in costs to provide public services.

The SGP would result in other benefits and costs besides those identified above. The primary purpose and benefit of the SGP action alternatives for the owner/operator would be mineral extraction. Although there are some construction and operational differences between the two action alternatives, their total future revenues would be approximately the same.

**Environmental Justice**

There are no environmental justice minority or low-income communities in the SGP area. However, the SGP area is within the traditional subsistence range of Tribal communities with environmental justice concerns including the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes. Tribal members are more susceptible to be impacted by local area resource changes due to both their use of the SGP area and their long-established cultural connections and attitudes to the local area resources. As a result, many of the SGP-related resource impacts would likely be perceived by Tribal members to have a greater and more long-term adverse impact than that by non-tribal users. For these reasons, Tribal members have a greater potential to be affected than the general population under both action alternatives.

**Special Designations**

**Wilderness**

No structures or human facilities would be developed inside the FCRNRW for the SGP. SGP operations would affect soundscapes, natural dark skies, and natural wildlife distribution within the FCRNRW, impacting the untrammeled quality of wilderness. The SGP would result in emissions that could affect air quality in the FCRNRW. However, emissions would be below NAAQS thresholds. Under the 2021 MMP, construction and use of the Burntlog Route near the FCRNRW boundary could increase noise and lights in adjacent wilderness areas. Use of the Johnson Creek Route under the Johnson Creek Route Alternative would eliminate these impacts. However, the volume of traffic and potential delays along Johnson Creek Route could result in forest visitors avoiding FCRNRW trailheads accessed from Stibnite Road (CR 50-412). Indirectly, recreation use in recommended wilderness areas and other areas of the FCRNRW could increase.

**Wild and Scenic Rivers**

**Impacts to WSR Free-Flowing Conditions**

No impacts to WSR free-flowing conditions are anticipated under either action alternative.

**Impacts to WSR Water Quality**

The 2021 MMP may impact water quality in Burntlog Creek as a result of increased sedimentation from the Burntlog Route construction, winter maintenance, and increased traffic from heavy vehicles. Under the Johnson Creek Route Alternative, Burntlog Creek would not be adversely impacted as the Burntlog Route would not be built. However, increased heavy vehicle traffic could increase sedimentation rates and
therefore decrease water quality in Johnson Creek due to use of Johnson Creek Road for all SGP-related traffic under the Johnson Creek Route Alternative.

**Impacts to Outstandingly Remarkable Values (ORVs)**
Under either alternative, the Heritage ORV of Johnson Creek may be adversely affected by the upgrade of the existing transmission line or the upgrade of Johnson Creek Road, which could potentially impact historic properties located in the vicinity. Under the 2021 MMP, the fish ORV of Burntlog Creek may be adversely impacted by increased sedimentation into fish spawning habitat in the creek.

**Impacts to Wild, Scenic, or Recreational Classification**
Under the 2021 MMP, the wild segment of Burntlog Creek would be adversely impacted by noise and visual effects from the extension, widening, and mine traffic usage of Burnt Log Road (FR 447). The recreational segment of Burntlog Creek could be adversely impacted if a proposed borrow source (i.e., gravel quarry) is sited at the only road access to the recreational segment of this creek.

**Inventoried Roadless Area**
The analysis of effects on roadless character focuses on the wilderness attributes of naturalness; undeveloped character; outstanding opportunities for solitude and primitive types of recreation; special features and values; and manageability which inform impacts to roadless area characteristics.

Construction of SGP facilities, access roads, and utilities would remove vegetation, alter topography, and modify fish and wildlife habitat within IRAs. Construction and operation of the SGP under the 2021 MMP would directly impact the Meadow Creek, Horse Heaven, Black Lake, Burnt Log, Caton Lake, and Reeves Creek IRAs. The Johnson Creek Route Alternative would have a reduced impact on IRAs. Under the Johnson Creek Route Alternative, improvements and use of only the Johnson Creek Route for mine access would eliminate impacts within the Black Lake and Burnt Log IRAs and within portions of the Meadow Creek IRA associated with the Burntlog Route.

**Research Natural Area**
SGP activities would be located downgradient of streams that flow through RNAs or would be in watersheds that do not contain streams that flow through RNAs. There would be no changes to water chemistry, temperature, or quality in the stream segments that flow through the RNAs.

Under the 2021 MMP, reconstructing approximately three miles of Burnt Log Road (FR 447) for the Burntlog Route would remove vegetation within 100 to 3,100 feet of the Chilcoot Peak RNA. Interim reclamation and vehicles could provide opportunities for non-native plant species to become established and spread into the RNA. There would be loss of the Chilcoot Peak RNA research and ecological process values if and where non-native plant species become established. Increased human activities could increase the risk of human ignited fires. Changes in the fire regime could result in a loss of research and ecological process values within the Chilcoot Peak RNA.

Under the 2021 MMP, installation of culverts on the Burntlog Route could change the movement of sediment, woody debris, and other organic material. Culverts could change water quantity or hydrologic connection and indirectly ecological processes in areas adjacent to the Chilcoot Peak RNA. The extent and duration of where there could be changes to ecological processes within Chilcoot Peak RNA is unknown.
The Burntlog Route would not be constructed under the Johnson Creek Route Alternative and would retain the existing ecological process values of the Chilcoot Peak RNA.

**Tribal Rights and Interest**

Either action alternative would cause disturbances that may impact tribal resources and would adversely affect tribal rights and interests. Locations of resources important to the Tribes identified through consultation and in the tribal ethnographic studies are not publicly disclosed due to confidentiality but are known to be present in the analysis area. Tribal fishing, hunting, and plant gathering activities occurred for millennia in this area, as supported by the archaeological record, known usual and accustomed fishing places, and descendant Tribes that continue to use the analysis area and exercise their rights to harvest and gather resources from their traditional places.

Construction and operation of the SGP would directly and indirectly effect tribal resources through physical impacts during construction, through visual impacts due to alteration of the landscape, as well as through audible elements that would impact solitude and tribal use of the analysis area, for example during spiritual practices and resource harvesting. Consultation with the Tribes would be ongoing; therefore, if there are additional discoveries of cultural significant sites or resources during or post construction, formal government-to-government consultation would occur.

Tribal access to the Operations Area Boundary would be restricted during the SGP’s construction, operations, and closure and reclamation phases, preventing tribal members from exercising their off-reservation rights to hunt, gather, and pasture on unoccupied federal lands, access streams and springs, and to fish in usual and accustomed places, for a period of 20 years.

The SGP would impact endangered salmon, other fish species, and essential fish habitat. Harm to fish, wildlife, and habitat would in turn impact availability and harvestability of these resources by Tribes at their usual and accustomed fishing places and traditional hunting and gathering places. Although the action alternatives differ in the acres of habitat affected for fish, wildlife, and plant species, there would be an impact to the availability and harvestability of tribal resources caused by the SGP. There are also concerns that the SGP would impact the Tribes’ fisheries restoration efforts. The Forest Service has therefore concluded that the SGP would have adverse impacts to tribal rights and interests under either the 2021 MMP or the Johnson Creek Route Alternative.
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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The United States (U.S.) Department of Agriculture Forest Service (Forest Service) has prepared this supplemental draft environmental impact statement (SDEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal laws and regulations. This SDEIS discloses the potential environmental effects of the alternatives considered for the Stibnite Gold Project (SGP or the Project) proposed by Perpetua Resources Idaho Inc. (Perpetua) in central Idaho. This document discloses the direct, indirect, and cumulative environmental effects of the Proposed Action and the Action Alternative. More than one federal agency is involved with the SDEIS for the SGP. The Forest Service, specifically the Payette National Forest (PNF), is the lead agency in the preparation of this document (40 CFR 1501.5). The Boise National Forest (BNF) is participating, as well as cooperating agencies including the U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), Idaho Governor’s Office of Energy and Mineral Resources (OEMR), Idaho Department of Lands (IDL), Idaho Department of Environmental Quality (IDEQ), and Valley County, Idaho.

This SDEIS was prepared in response to a modified Plan of Restoration and Operations (Plan) for the SGP. The Forest Service received the original SGP Plan in 2016, (Midas Gold Idaho, Inc. [Midas Gold] 2016a) for review and approval in accordance with regulations at 36 Code of Federal Regulations (CFR) 228 Subpart A. A revised Plan, also known as ModPRO1, was submitted to the Forest Service in 2019 (Brown and Caldwell 2019a). A further modified Plan, also known as ModPRO2, was initially submitted in December 2020 with a revised submittal in October of 2021 (Perpetua 2021a). Midas Gold changed their name to Perpetua Resources Ltd (Perpetua) in February 20213. The SGP proposes mine operations on federal, state, and private lands located in Valley County, Idaho.

A draft EIS (DEIS) evaluating five alternatives based on the revised Plan was published August 2020. The further modified mine plan intends to reduce new surface disturbance and anticipated environmental impacts while providing revised descriptions and predicted environmental effects to be considered in the EIS. In addition, comments received on the DEIS recommended that a supplemental DEIS should be prepared for various reasons. Therefore, the Forest Service determined that a SDEIS is warranted and two of the previous action alternatives (August 2020 DEIS Alternatives 1 and 3) were eliminated from further consideration (see Section 2.6 for discussion about alternatives dismissed from detailed analysis).

Additional documentation describing the rationale for developing a SDEIS, the analyses of the effects of the alternatives considered (i.e., August 2020 DEIS), public involvement, and other relevant documents may be found within the Project record located at the Forest Service’s Payette National Forest Supervisor’s Office, 500 North Mission Street, McCall, Idaho.

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1 Associated project documents may reference the Revised Plan as the ModPRO.
2 Associated project documents may reference the Modified Plan as the ModPRO2.
3 Documents provided by Perpetua prior to the February 2021 name change will still be cited and referenced as Midas Gold.
1.2 Stibnite Mining District History

Prospecting in this region of Idaho began in the 1890s. Gold and antimony mineralization was discovered in the Stibnite area with the first mining claims staked in 1914 (Midas Gold 2016a). The claimants organized the Meadow Creek Silver Mines Company and began minor underground mining in 1919 developing what would become the Meadow Creek Mine, now referred to as the Hangar Flats area. Multiple mining companies considered the Meadow Creek Mine but found the gold/silver/antimony mineralization too difficult to process in milling circuits of the time. Underground development work continued until 1927 when the property was optioned by the Yellow Pine Company.

The Yellow Pine Company invested in a major expansion of the Meadow Creek Mine which, by 1929, included an enlarged camp and a road to connect the mine with the town of Yellow Pine. Expansion of the underground mine from its original portal continued, with other adits driven to gain underground access into other parts of the property including the North Tunnel, Monday Tunnel, and Cinnabar Tunnel. A new camp was built at the location of these two later tunnels south of the current Yellow Pine pit. Additional surface facilities were constructed at Monday Camp including housing, shops, assay facilities, an air strip, and a post office.

In order to provide power for the Meadow Creek and Monday mine camp and facilities, the Yellow Pine Company constructed a reservoir on the East Fork of Meadow Creek in 1930 and installed a wooden pipe and steel penstock between the reservoir and a hydroelectric plant built on Sugar Creek.

Ongoing metallurgical testing of the Meadow Creek Mine ore lead to the construction of a 150-ton per day pilot mill in 1931 at Meadow Creek Camp.

The Meadow Creek Mine was the largest antimony producer in the U.S. and a major gold/silver producer in Idaho. Milling and mining continued at the Meadow Creek Mine until 1938 (Midas Gold 2016a), when the Yellow Pine Company property was taken over by the Bradley Mining Company (BMC).

After 1938 BMC focused on development of an open pit mine at the Yellow Pine deposit which contained higher gold values and lower antimony grades than at the Meadow Creek Mine. Ore was extracted from pits on the east and west sides of the East Fork South Fork Salmon River (East Fork SFSR) and hauled south in trucks from the Yellow Pine open pit to the mill at the Meadow Creek Mine. The mill was expanded from 200 to 400-tons per day capacity and renamed the Stibnite Mill. Mill tailings were initially released into Meadow Creek and later into a tailings impoundment adjacent to the mill.

Beginning in 1939, the federal government began purchasing mineral commodities, including antimony and tungsten, considered to be of strategic importance. The U.S. Geological Survey (USGS) and Bureau of Mines supported detailed exploration of the Yellow Pine deposit with the discovery of economic values of tungsten in 1941. With the federal government's wartime interest in both antimony and tungsten produced from the Yellow Pine deposit, BMC expanded mine operations and upgraded the Stibnite Mill to produce a tungsten concentrate in addition to antimony and gold/silver concentrates. Expansion of the mining at the Yellow Pine deposit included enlarging the open pit along with underground mining and diversion of the East Fork SFSR in a tunnel, called the Bailey Tunnel, which discharged the river water into Sugar Creek (Mitchell 2000). By this time, fish passage to the upward reaches of the East Fork SFSR became impassable due to the development of the Yellow Pine deposit and open pit.
During World War II, BMC continued to expand mining and milling operations at the Meadow Creek Mine. As employment at the mine increased, the Meadow Creek camp grew into the town of Stibnite and included homes, recreational facilities, school, hospital, general store, and other commercial facilities. Two other neighborhoods were also established along lower Fiddle Creek and Midnight Creek. Idaho Power Company built a power line to Stibnite in 1943 which allowed expansion of the Stibnite Mill and provided additional power to support mining and community demands. By the end of the war, the tungsten ore in the Yellow Pine pit was exhausted and lesser tungsten mineral production continued for a time from a placer operation downstream of the Yellow Pine pit.
The tailings storage area west of the mill reached capacity in 1946. A large tailings dike was built south of
the mill in the Meadow Creek valley. Meadow Creek was diverted in order to contain more tailings.
Between 1946 and 1952, BMC deposited an estimated four million tons of tailings in this storage facility.
In 1947 BMC constructed an antimony smelter at the Stibnite Mill to process the antimony concentrate.
Subsequently, the antimony price dropped, and operations of the Yellow Pine Mine and Stibnite Mill and
Smelter were shut down in the 1950s. The Bailey Tunnel diversion of the East Fork SFSR was
abandoned, and the East Fork SFSR was allowed to flow over the south edge of the Yellow Pine pit
forming a pit lake. Meadow Creek was rerouted over the BMC tailings impoundment, resulting in erosion
of the tailings. Residents living in the valley moved out and over time the mine and town buildings in the
valley were abandoned or moved to other locations (Petersen 1999). Although exploration work
continued into 1955 after active mining ceased in 1952, it did not trigger the resumption of mining.

In the 1970s, the technology of cyanide heap leaching of low-grade gold/silver ores was developed by the
U.S. Bureau of Mines and this raised renewed interest in many former gold production districts including
Stibnite. Superior Oil Company (Superior) conducted geological, geophysical, and geochemical
investigations from 1974 to 1977 to evaluate the potential for heap-leach oxide gold and silver in the
West End and adjacent Stibnite deposit, which led to permitting of the open pit West End Mine with the
Forest Service and mine operations by Superior commenced in 1982. An on-off, cyanide heap leach
facility that included five lined leach pads, solution ponds, and a gold/silver recovery plant was built north
of the former Stibnite Mill in the Meadow Creek Valley west of East Fork SFSR. Between 1982 and 1996
more than six million tons of ore were leached in this facility. After gold/silver was extracted from the ore
it was rinsed of its cyanide content and removed from the leach pads. This "spent" ore was hauled to the
former Stibnite Mill tailings storage facility and spread over the top of the fine-grained tailings. This area
was called the Spent Ore Disposal Area (SODA) and included a diversion of Meadow Creek out of the
old tailings area.

Mobile Oil Corporation purchased Superior in 1984 and suspended operations of the West End Mine in
1985 but continued to leach previously mined ore. The West End Mine and leach facilities were
purchased by Pioneer Metals Corporation (Pioneer) in 1986 and were operated by Pioneer until 1991.

Between 1988 and 1992 Hecla Mining leased some of the BMC claims and developed an open pit gold
mine just north of the Yellow Pine pit called the Homestake pit. Initially ore from the pit was leached at
the Pioneer on-off leach facility under a tolling agreement between the companies. In 1990 Hecla
constructed its own leach pad and plant near Stibnite which operated until 1992. The Hecla mine and
leach areas were reclaimed between 1991 and 1993.

Beginning in 1991 the former Pioneer operations were operated by a number of other mining companies
who developed other deposits including the Stibnite and Garnet Creek pits. All mining and leaching
operations in the Stibnite area ceased in 1996.
1.3 Comprehensive Environmental Response, Compensation, and Liability Act Background

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, was enacted by Congress in 1980 and amended in 1986, to respond to pollution and the threats posed to human health and the environment from the release, or imminent threat of a release, of hazardous substances. The law authorizes short-term removal actions requiring prompt response and long-term remedial responses at sites, including those listed on EPA's National Priorities List (NPL). CERCLA provides that the potentially responsible parties for releases of hazardous substances pay the costs to investigate and remEDIATE contaminated sites.

The Stibnite Mine Site (CERCLIS [Comprehensive Environmental Response, Compensation and Liability Information System] #9122307607, the Site) was assessed and proposed to be added to the NPL in 2001. Key state and congressional leaders supported funding the cleanup of the Site but opposed the stigma of adding the site to the NPL, thus the Site was not listed. Before 2001, some mining operators at the site conducted activities to reduce the release of hazardous substances. Since 2001, the Forest Service has conducted multiple projects under its CERCLA authority to reduce releases at the Site. The current owner of the site, Perpetua, has proposed to renew mining activities with the proposed SGP intended to address certain impacts associated with the legacy mining as described in Chapter 2 of this SDEIS. The SGP activities would be conducted under applicable mining law and regulations without connection to CERCLA.

In January 2021, Perpetua and affiliates entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) with the EPA and the Forest Service under CERCLA to conduct cleanup of certain conditions at the Site, these areas are mostly outside of and not included in the proposed mining project.

As described in Section 1.2, the mining, milling, smelting, and leaching activities in the district left behind impacts including underground mine workings, multiple open pits, development rock dumps, mill tailings deposits, cyanidation heap leach pads, neutralized (spent) heap leach ore piles, a mill and smelter site, three town sites, camp sites, a washed-out earthen dam (with its associated erosion and downstream sedimentation), haul roads, an abandoned water diversion tunnel, an airstrip, and other disturbances.

Releases of hazardous substances at the Site are documented in multiple studies. Currently, there are ongoing releases of hazardous substances, pollutants, and contaminants to surface water and groundwater at the site including elevated concentrations of antimony, arsenic, copper, lead, mercury, and cyanide. Most notable are elevated concentrations of arsenic and antimony. Past mining activities have also caused alterations to stream configurations and habitat including formation of the Yellow Pine pit lake, sediment and tailings deposits, development rock dumps, and channel diversions.

In the early 1980s spent ore from on/off leach pads was purposely placed over fine-grained tailings deposited in the valley from earlier operations, known as the Bradley Tailings. This feature referred to as the Spent Ore Disposal Area (SODA), was intended to cover the Bradley tailings and prevent their erosion. In the 1990s the mine operator Stibnite Mine Inc. entered into an Administrative Order on Consent (AOC) with EPA to divert stream flow and stabilize the Bradley Tailings/SODA disposal area to improve water quality in Meadow Creek, but the company did not complete the AOC scope of work. In
1998, a new AOC was signed between Mobil Oil Corporation, EPA, and the Forest Service to stabilize and reclaim the Bradley Tailings/SODA area. This work included construction of two diversion channels, lining an old diversion channel to reduce seepage, closing a pond, covering exposed tailings, restoring more natural stream channel features, and reclaiming the area with vegetation. This work was completed in 1999.

Pursuant to its CERCLA authorities, the Forest Service engaged in multiple remediation projects in the district to further reduce impacts from the legacy mining activities. In 2002, the Forest Service removed tailings from a pond and soils located at the former smelter stack area. The material was placed in a repository located at the Bradley NW development rock dump. The Meadow Creek floodplain was reconstructed in the former pond area. In 2004 and 2005, the Forest Service reconstructed Meadow Creek directly downstream of Smelter Flats. This included the removal of tailings from the channel and depositing this material in a new containment cell located on the SODA. The new channel banks were revegetated with willow plants and the old channel was backfilled and reclaimed. In 2009, the Forest Service regraded and covered a portion of the remaining tailings at Smelter Flats to prevent further erosion and exposure risk.

With the signing of the 2021 ASAOC, the parties to the Agreement plan to address certain legacy mining impacts under CERCLA that would not otherwise be addressed by the proposed SGP activities by Perpetua outside the project footprint. The ASAOC includes three primary phases. Phase 1 includes several “time critical removal actions” (TCRAs) consisting of stream diversion ditches designed to avoid contact of water with sources of contamination, and removal of approximately 325,000 tons of development rock and tailings from locations in Meadow Creek or East Fork SFSR that are currently impacting water quality. Phase 1 also includes baseline studies of conditions at five historic mine adits where mine water is discharging. Implementation of removal actions to address the adits is optional under the ASAOC. The purpose of these studies is to collect information to inform potential future CERCLA removal actions at these locations. In addition, Perpetua conducted a biological assessment, Clean Water Act evaluation, and a cultural resource survey to support Phase 1 activities. Phase 1 activities would be accomplished regardless of the status and potential approval of the SGP and is scheduled to be completed between 2021 and 2025. Perpetua is providing $7.5 million in financial assurance for the Phase 1 scope of work.

When all work in Phase 1 is completed, and if approvals and permits have not been obtained by Perpetua for the SGP, the company, upon approval by the agencies, may elect to perform activities in the optional Bridge Phase described in the ASAOC. These activities would potentially include additional water diversions, capping or covering of mine waste in place, and targeted removal of additional mine waste materials to improve water quality. The Bridge Phase would be completed within a year of the agencies’ acceptance of the work plan for this phase if Perpetua and the Agencies elected to implement the activities.

Optional Phases 2 and 3 would be conducted if elected by Perpetua and approved by the agencies. The work would consist of “Non-time Critical Removal Actions” (NTRCAs) and would only be performed by Perpetua if it has obtained approval for the proposed SGP. Phase 2 would consist of further planning and implementing potential removal actions at the five adits studied in Phase 1. Phase 3 would consist of a synoptic study of two reaches of the East Fork SFSR to identify areas for implementation of additional
removal actions in locations identified in the ASAOC Statement of Work and agreed to by the parties that would not be subject to mining and reclamation activities under the SGP in effect at that time. Because these phases are optional, phases 2 and 3 are not considered reasonably foreseeable by the EPA and therefore are not included as cumulative or connected actions within this environmental impact statement (EIS).

1.4 Stibnite Gold Project Overview

The 2021 Modified Mine Plan (2021 MMP) proposes use of the surface of National Forest System (NFS) lands in connection with operations authorized by the U.S. mining laws within the Operations Area Boundary. The 2021 MMP provides details for the construction, operation, reclamation, and closure of a gold, silver, and antimony mine. The following elements are integral to the 2021 MMP:

- Mine pit locations, areal extents, and mining and backfilling methods
- Transportation on existing and proposed roads
- Pit dewatering, surface water management, and water treatment
- Ore processing
- Lime generation plant
- Tailings Storage Facility (TSF) construction and operation
- TSF Buttress construction methods
- Water supply needs and uses
- Management of mine impacted water and stormwater runoff
- Electrical transmission lines
- Stibnite Gold Logistics Facility (SGLF)
- Road maintenance facility
- Surface and underground exploration
- Worker housing facility

1.5 Operations Area Boundary

The SGP Operations Area Boundary, associated access roads, and off-site facilities are located in Valley County, Idaho. The Operations Area Boundary is situated approximately 98 miles by air and 146 miles by road northeast of Boise; approximately 44 air miles and 68 miles by road northeast of Cascade; and approximately 10 air miles and 14 miles by road east of the village of Yellow Pine, Idaho (Figure 1.5-1). Activities described in the 2021 MMP would occur within approximately 820 acres of private lands (including approximately 535 acres of patented mining claims owned or controlled by Perpetua), approximately 2,372 acres of NFS lands, 13 acres of federal land administered by the Bureau of Reclamation, and 62 acres of public lands administered by the State of Idaho.
1.6 Purpose And Need

1.6.1 Purpose and Need for Federal Action

The Forest Service’s purpose is to consider approval of Perpetua’s proposed use of the surface of NFS lands in connection with operations authorized by the U.S. mining law as first described in the Plan submitted September 2016, then refined in 2019 (Brown and Caldwell 2019a), and further modified in 2021 as the 2021 MMP (Perpetua 2021a). The Forest Service’s need for action is to ensure that the proposed occupancy and use of NFS lands is consistent with statutory and regulatory requirements. For purposes of this environmental analysis, the agency is assuming the proposed uses would be able to be authorized under existing regulatory authorities. However, the agency will need to evaluate the eventual applications for rights of way to make a final determination.

The need for action is to:

- Consider approval of Perpetua’s 2021 MMP for development of the SGP to mine gold, silver, and antimony deposits that, where feasible, would minimize adverse environmental impacts on NFS surface resources; and ensure that measures are included that provide for mitigation of environmental impacts and reclamation of the NFS surface disturbance.

1.6.2 USACE’S Purpose and Need

Perpetua’s 2021 MMP includes the discharge of dredge and fill material into waters of the U.S. (WOTUS), including wetlands. Accordingly, the USACE, pursuant to Section 404 of the Clean Water Act (CWA), will review the SGP and render a decision to either issue, issue with special condition, or deny a permit for the Project. As a cooperating agency the USACE intends to use this EIS process and document for evaluating compliance with its responsibilities under NEPA and the CWA Section 404(b)(1) Guidelines. As part of its review, the USACE is required by the CWA to independently consider and express the activity’s underlying purpose and need from Perpetua’s (the applicant) and the public’s perspectives (33 CFR 325).

From the USACE’s perspective, the basic purpose for the SGP is to extract gold, silver, and antimony from ore. Under the CWA Section 404(b)(1) Guidelines (40 CFR 230), the USACE uses the basic project purpose to determine if a project is “water dependent.” A project is water dependent if it must be located in, or be close to, a special aquatic site, including wetlands, to fulfill its basic purpose. The USACE has determined that mining gold, silver, and antimony ore is not a water-dependent activity. The overall project purpose is to mine gold, silver, and antimony from ore deposits associated with the SGP. This overall project purpose will be used for evaluating practicable alternatives under the 404(b)(1) guidelines. The 404(b)(1) analysis will be completed by the USACE following the receipt of public comments on both this SDEIS and Perpetua’s application for a Department of the Army (DA) permit for the SGP.
Figure 1.5-1
Project Location
Stibnite Gold Project
Stibnite, ID

Legend
- Proposed Mine Site Location

Project Components *
- Utilities
  - Existing Powerline
  - Existing Communication Tower
  - Existing Substation**

Other Features
- U.S. Forest Service
- Wilderness
- Monumental Summit
- County
- City/Town
- Highway
- Road
- Stream/River
- Lake/Reservoir

Surface Land Management
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- U.S. Forest Service

Basemap: USGS Shaded Relief
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest; Stantec

0 2.5 5 Miles
1 inch = 4.5 miles when printed at 11x17

Forest Service Road Number Road Name Map Label
FR 447 Burnt Log Road 447
FR 467 Cabin Creek Road 467
FR 51290 Meadow Creek Lookout Road 51290
FR 50375 Thunder Mountain Road 50375

* Project Components are associated with existing conditions
** Substation locations are approximate
1.7 Federal Decision Framework

The U.S. mining laws (30 U.S.C. 21-54), govern the exploration and development of minerals on public lands. Locatable minerals operations on NFS lands are subject to regulations found at 36 CFR 228 subpart A. Locatable mineral operations are to be conducted so as to, where feasible, minimize adverse environmental impacts on National Forest surface resources (36 CFR 228.8). In prospecting, locating, and developing the mineral resources, all persons must comply with the rules and regulations covering the National Forests (16 U.S.C. 478). All functions, work, and activities on NFS lands in connection with prospecting, exploration, development, mining, or processing of mineral resources and all uses reasonably incident thereto, including roads that are constructed and maintained in connection with development and mining of mineral resources, are operations authorized by the U.S. mining laws (36 CFR 228.3(a)).

The Forest Service is the lead agency in the preparation of this document (40 CFR Part 1501.5). The USACE is a federal cooperating agency with decisions to be made based on this environmental analysis consistent with the NEPA. Other federal, state, and local agencies are also participating in this review as cooperating agencies as noted in Section 1.1.

1.7.1 Forest Service Decisions

The Payette Forest Supervisor, as the responsible official acting on behalf of the lead agency, has determined that preparation of an EIS is required because approving the 2021 MMP may have significant impacts on the human environment (40 CFR Part 1501). The Payette Forest Supervisor will make the following decisions:

- Whether to approve the 2021 MMP as submitted, or any alternative considered in detail in the final EIS (FEIS).
- Whether to amend the Payette Forest Plan (FEIS and Record of Decision for the Revised Payette Land and Resource Management Plan, 2003 is incorporated by reference). One or more project-specific amendments to the forest plan would be required.

The Boise Forest Supervisor will make the following decisions:

- Whether to amend the Boise Forest Plan (FEIS and Record of Decision for Revised Boise Land and Resource Management Plan, 2010 is incorporated by reference). One or more project-specific amendments to the forest plan would be required.

The Payette and Boise Forest Plans provide direction relevant to the 2021 MMP and its alternatives through forest-wide plan components and management areas. Management Areas (MAs) in the SGP area include the following:

**Payette National Forest**

- Management Area 13 Big Creek/Stibnite

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4 Forest plan amendments are evaluated under the 2012 Planning Rule per 36 CFR Part 219.17(b)(2), which requires all forest plan amendments initiated after May 9, 2012, to use the 2012 Planning Rule.
Boise National Forest

- Management Area 17 North Fork Payette River
- Management Area 19 Warm Lake
- Management Area 20 Upper Johnson Creek
- Management Area 21 Lower Johnson Creek

Amendments to the Payette and Boise Forest Plans would be required to approve the 2021 MMP or the Johnson Creek Route Alternative. A forest plan may be amended at any time. The responsible officials (Boise and Payette Forest Supervisors) have the discretion to determine whether and how to amend the plan(s) and to determine the scope and scale of any amendment. A plan amendment is required to add, modify, or remove one or more plan components. The proposed removal of the below identified forest plan Standards would be one-time amendments to the current forest plans and would be project-specific and apply only to the SGP. These amendments would be made according to the 2012 Planning Rule (36 CFR Part 219.13) and will comply with the direction in both forest plans relating to Standards.

Opportunities for public participation and notification regarding the forest plan amendments will be combined with the public participation and notification processes used for project planning at 36 CFR Part 218 for this EIS (36 CFR 219.13). The project-specific amendments for the SGP may have effects directly related to 2012 planning rule’s substantive requirements regarding sustainability (Section 219.8), plant and animal community diversity and persistence of native species (Section 219.9), multiple use (Section 219.10), timber (Section 219.11), and others.

Forest Plan amendments, summarized in Table 1.7-1, could be needed in four resource topics, depending on the action alternative selected, to allow the SGP to be consistent with the Payette and Boise Forest Plans.

**Table 1.7-1 Forest Plan Amendments**

<table>
<thead>
<tr>
<th>Resource</th>
<th>Plan Component</th>
<th>Current Forest Plan Component Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Management Actions</td>
<td>PNF Standard 1301</td>
<td>Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary time period (up to 3 years), and must be designed to avoid resource degradation in the short term (3-15 years) and long term (greater than 15 years).</td>
</tr>
<tr>
<td></td>
<td>PNF Standard 1306</td>
<td>Management activities that may affect Total Soil Resource Commitment (TSRC) shall meet the following requirements:</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 2010</td>
<td>- In an activity area where existing conditions of TSRC are below 5 percent of the area, management activities shall leave the area in a condition of 5 percent or less TSRC following completion of the activities.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 2113</td>
<td>- In an activity area where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 1919</td>
<td>- In an activity area where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 2005</td>
<td>- In an activity area where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation.</td>
</tr>
</tbody>
</table>
For further information pertaining to meeting forest plan consistency requirements, please see the Forest Plan Consistency Analysis by resource in Chapter 4. Substantive requirements (219.8 through 219.11) that are directly related to plan direction being modified through proposed Forest Plan amendments are described in Appendix A. Determinations can be based on adverse, as well as beneficial, effects (36 CFR 219.13(b)(5)(i)). Plan amendments that apply to a specific project can use the analysis prepared for the project as documentation (36 CFR 219.13(b)(1)). For each proposed amendment described in Appendix A, the location of the relevant analysis in the SDEIS is identified.

### 1.7.2 USACE Decisions

The USACE, under Section 404 of the CWA, will review the Project and either issue, issue with special conditions or deny a permit for the Project. The USACE regulates the discharge of dredged and/or fill material into WOTUS, including wetlands (Section 404 of the CWA). The 2021 MMP would place dredged and/or fill material in WOTUS as regulated under Section 404 of the CWA. A CWA Section 404 permit is required for the discharge of dredged and/or fill material into jurisdictional WOTUS (33 CFR Part 323).

In accordance with the CWA Section 404(b)(1) guidelines (40 CFR Part 230), the USACE may permit only the least environmentally damaging practicable alternative while considering cost, logistics, and technology. The USACE has determined that potentially jurisdictional WOTUS, including wetlands, are

<table>
<thead>
<tr>
<th>Resource</th>
<th>Plan Component</th>
<th>Current Forest Plan Component Text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PNF and BNF Standard SCST01</td>
<td>All projects shall be designed to meet the adopted Visual Quality Objectives (VQOs) as identified in Management Area direction and represented on the Forest VQO map.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 1767 (MA 17)</td>
<td>Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FSH 22.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 1983 (MA 19)</td>
<td>Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FSH 22 and Forest Road (FR) 467.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 2052 (MA 20)</td>
<td>Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413.</td>
</tr>
<tr>
<td></td>
<td>BNF Standard 2155 (MA 21)</td>
<td>Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413, FR 416 W to Hennessey Meadow, and FR 440.</td>
</tr>
<tr>
<td>Fish</td>
<td>PNF Standard SWST09</td>
<td>In fish-bearing waters, do not authorize new surface diversions unless they provide upstream and downstream fish passage and, if needed, include either fish screens or other means to prevent fish entrapment/entainment.</td>
</tr>
</tbody>
</table>
present that may be impacted by the Project. These waters are described in the “Wetlands and Riparian Resources” section of Chapter 3.

### 1.7.3 Key Permits Necessary to Implement the Plan of Operations

To implement the 2021 MMP and activities described in this EIS, Perpetua would need to obtain (or renew) permits and licenses. Table 1.7-2 is a list of the key permits likely required to implement the 2021 MMP or the action alternative.

#### Table 1.7-2 Key Permits, Approvals, and Regulation Compliance Likely Required

<table>
<thead>
<tr>
<th>Agency</th>
<th>Permit or Authorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Forest Service</td>
<td>• Approved Plan of Operations (meeting the requirements of the Payette and Boise Forest Plans)</td>
</tr>
<tr>
<td></td>
<td>• New Special Use Permit (SUP) for extension of the transmission line (PNF)</td>
</tr>
<tr>
<td></td>
<td>• Revised SUP for the upgrade of transmission line 328 (BNF)</td>
</tr>
<tr>
<td></td>
<td>• Timber Sale Permit(s) and Contract(s)</td>
</tr>
<tr>
<td>USACE Regulatory Division</td>
<td>• DA authorization pursuant to CWA Section 404</td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency</td>
<td>• CWA Section 404 Permit Review</td>
</tr>
<tr>
<td></td>
<td>• Spill Prevention Control and Countermeasures Plan (SPCC)</td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>• Incidental Take Permit pursuant to Section 7 of the Endangered Species Act (ESA)</td>
</tr>
<tr>
<td></td>
<td>• Protection of migratory birds under the Migratory Bird Treaty Act</td>
</tr>
<tr>
<td></td>
<td>• Protection of bald and golden eagles under the Bald and Golden Eagle Protection Act</td>
</tr>
<tr>
<td>U.S. Department of Transportation</td>
<td>• Hazardous Materials Transportation Permit</td>
</tr>
<tr>
<td>U.S. Bureau of Reclamation</td>
<td>• Updated Land Use Authorization for upgrade of existing transmission line 328</td>
</tr>
<tr>
<td>National Oceanic and Atmospheric Administration National Marine Fisheries Service</td>
<td>• Incidental Take Permit pursuant to Section 7 of the ESA</td>
</tr>
<tr>
<td>Mine Safety and Health Administration</td>
<td>• Issue a mine identification number</td>
</tr>
<tr>
<td></td>
<td>• Legal Identity Report</td>
</tr>
<tr>
<td></td>
<td>• Approval of Ground Control Plan</td>
</tr>
<tr>
<td></td>
<td>• Approval of Mine Health and Safety Training Plan</td>
</tr>
<tr>
<td>Federal Communications Commission</td>
<td>• Radio Authorizations</td>
</tr>
<tr>
<td>Treasury Department (Bureau of Alcohol, Tobacco, Firearms and Explosives)</td>
<td>• High Explosives Permit</td>
</tr>
<tr>
<td></td>
<td>• Explosives Manufacturing Permit (ammonium nitrate and fuel oil [ANFO])</td>
</tr>
<tr>
<td>State Historic Preservation Officer</td>
<td>• Section 106 Consultation under the National Historic Preservation Act (NHPA)</td>
</tr>
</tbody>
</table>
### 1.8 Tribal Participation

The government-to-government relationship between federal agencies and federally-recognized tribes is a special relationship based on tribal sovereignty. The Forest Service is conducting government-to-government consultation with these federally recognized tribes: the Nez Perce Tribe, the Shoshone-Paiute Tribes, and the Shoshone-Bannock Tribes. The Forest Service requested scoping input from the tribes through letters dated May 31, 2017 (Shoshone-Paiute Tribes), June 1, 2017 (Shoshone-Bannock Tribes), and June 6, 2017 (Nez Perce Tribe). The Forest Service presented the SGP and initiated consultation during government-to-government meetings (Nez Perce Tribe May 23, 2017; Shoshone-Bannock Tribes July 26, 2017; and Shoshone-Paiute Tribes April 13, 2017). The Forest Service offered the Tribes cooperating agency status but the Tribes declined. Since then, numerous meetings, calls, and communications have occurred. Government-to-government consultation will continue throughout the process. Details of this consultation are included in Chapter 6 of this SDEIS.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Permit or Authorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho Department of Lands</td>
<td>• Mine and Reclamation Plan Permit and Permanent Closure Plan under the Mined Land Reclamation Act</td>
</tr>
<tr>
<td></td>
<td>• Compliance with Best Management Practices for Mining in Idaho</td>
</tr>
<tr>
<td>Idaho Department of Water Resources</td>
<td>• Stream Channel Alteration Permits</td>
</tr>
<tr>
<td></td>
<td>• Water Well Drilling Permits</td>
</tr>
<tr>
<td></td>
<td>• Mine Tailings Impoundment Approval for Construction</td>
</tr>
<tr>
<td></td>
<td>• Water Right Permits</td>
</tr>
<tr>
<td>Idaho Department of Environmental Quality</td>
<td>• Air Quality Permit to Construct under Rules for the Control of Air Pollution in Idaho</td>
</tr>
<tr>
<td></td>
<td>• Section 401 Certification under the CWA</td>
</tr>
<tr>
<td></td>
<td>• Application for Point of Compliance under the Ground Water Quality Rule</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Rules for Ore Processing by Cyanidation</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Idaho Rules for Public Drinking Water Systems</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Water Quality Standards</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Solid Waste Management Rules</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Rules and Standards for Hazardous Waste</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Individual/Subsurface Sewage Disposal Rules</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Wastewater Rules</td>
</tr>
<tr>
<td></td>
<td>• Compliance with the Recycled Water Rules</td>
</tr>
<tr>
<td></td>
<td>• Stormwater General National Pollutant Discharge Elimination System Permit(s)</td>
</tr>
<tr>
<td></td>
<td>(construction or multi-sector)</td>
</tr>
<tr>
<td></td>
<td>• Wastewater Discharge Permit under Idaho Pollutant Discharge Elimination System Rules</td>
</tr>
<tr>
<td>State Fire Marshal</td>
<td>• Compliance with the International Fire Code</td>
</tr>
<tr>
<td>Office of Emergency Management</td>
<td>• Tier II Reporting under the Emergency Planning and Community Right to Know Act (EPCRA)</td>
</tr>
<tr>
<td></td>
<td>• TRI Reporting under the EPCRA and Pollution Prevention Act</td>
</tr>
<tr>
<td>Valley County</td>
<td>• Conditional Use Permit</td>
</tr>
<tr>
<td></td>
<td>• Building Permits</td>
</tr>
<tr>
<td></td>
<td>• Compliance with Valley County Liquefied Petroleum Gas Systems Ordinance</td>
</tr>
<tr>
<td></td>
<td>• Compliance with Valley County Public Road Easement Stipulations</td>
</tr>
</tbody>
</table>

Table Source: Perpetua 2021a
1.9 Scoping and Public Engagement

The Forest Service published a notice of intent (NOI) to prepare an EIS for the SGP in the Federal Register June 5, 2017. The NOI initiated a 45-day scoping period which ended July 20, 2017. During this time period, the Forest Service conducted five public meetings, including in-person meetings in Cascade, McCall, Yellow Pine, and two in Boise, Idaho. A legal notice was published in *The Idaho Statesman*, Boise, Idaho (the newspaper of record), and *The McCall Star News*, McCall, Idaho June 1, 2017.

The PNF received a total of 536 submissions during public scoping. The Scoping and Issues Summary Report can be viewed here: https://www.fs.usda.gov/project/?project=50516.

A notice of availability (NOA) for the DEIS was published in the Federal Register August 20, 2020. The NOA initiated a 60-day comment period; in response to requests for extension, a 15-day extension was granted for public comments on the DEIS. In total, approximately 10,000 submissions were received during the 75-day comment period in response to the DEIS. During that time, a virtual, on-line Project information room provided SGP data for review such as posters, documents, and figures; due to the COVID-19 pandemic, in-person public meetings were not held. In addition, DEIS reference documents were available via a linked document on the Project webpage, except for information held as confidential per Forest Service procedures. The issues evaluated in this SDEIS are derived from public comments originally made during the public scoping period and summarized in the SGP Scoping and Issues Summary Report issued in January 2018 (AECOM 2018). In that document, the comments received during scoping from agencies and the public were summarized into categories, which became the basis for defining issues and indicators. After the public comment period for the SGP DEIS, Midas Gold (now Perpetua) revised the Plan to address potential impacts and public concerns. The comments received on the SGP DEIS were reviewed as additional scoping input during development of this SDEIS.

Additional details regarding public involvement and public scoping are provided in Chapter 6, Section 6.1, Public Participation Summary.

1.10 Issues

Using the comments from public and agency scoping, the Forest Service, in coordination with cooperating agencies, developed a list of resource concerns and topics to address in this SDEIS. For each issue, indicators were created to describe, compare, and contrast the effects of the Proposed Action and alternatives carried forward for detailed analysis.

1.10.1 Significant Issues

The regulations implementing NEPA require federal agencies to develop and evaluate alternatives to Proposed Actions that involve unresolved conflicts concerning alternative uses of available resources (40 CFR 1501.2). Significant issues are those which are used to formulate alternatives to the Proposed Action and to develop mitigation measures. The following significant issues were identified for the SGP and are listed below with indicators which measure and compare potential effects. Significant issues are analyzed in depth in the EIS (40 CFR 1501.7(a)(2)) and may be a cause/effect relationship between the Proposed Action and a significant impact (Forest Service Handbook [FSH] 1909.15 chap. 12.41 [Forest Service 2015a]).
1.10.1.1 Fish Resources and Fish Habitat

Construction and operation of mine infrastructure may impact the quality and quantity of water, habitat for Chinook salmon, steelhead, and bull trout. SGP activities may also affect fish behavior and reproductive success and may result in injury or mortality of Chinook salmon, steelhead, and bull trout in the analysis area.

Indicators:

- Changes in stream and lake habitat directly impacted by channel removal (kilometers [km]).
- Change in amount of total useable Chinook salmon Intrinsic Potential (IP) habitat (km).
- Direct loss of Chinook salmon Critical Habitat (km).
- Changes in total useable steelhead IP habitat (km).
- Changes in the length of available bull trout habitat (km).
- Bull trout occupancy probability.
- Changes in access to bull trout lake habitat.
- Direct loss of bull trout critical habitat (km).
- Length of westslope cutthroat trout habitat (km).
- Westslope cutthroat trout occupancy probability.
- Changes in stream peak and baseflow (cubic feet per second [cfs]).
- Changes in water temperature (degrees Celsius [°C]).
- Changes in water chemistry (analysis criteria).

1.10.1.2 Surface Water and Ground Water Quantity and Quality

Construction and operation of mine infrastructure may impact water quality and quantity within the analysis area.

Indicators:

- Mineralized waste generated (tons, closure stabilization, and water chemistry).
- Exposures of ore bodies/potentially acid-generating material (rock and water chemistry).
- Legacy mine tailings and waste rock (rock and water chemistry).
- Methylation rates for mercury (water chemistry).
- Surface water quality (water chemistry and temperature).
- Groundwater quality (water chemistry).
- Stream flow characteristics (daily, seasonal, annual).
- The extent, magnitude, and duration of changes in groundwater levels (feet of drawdown).
1.10.1.3 **Tribal Rights and Interests**

Construction and operation of mine infrastructure may impact access to reserved Tribal rights and resources. Construction and operation of mine infrastructure may impact tribal resources.

**Indicators:**

- Existence of the Nez Perce Tribe Treaties (1855 and 1863).
- Existence of Shoshone-Bannock Treaty (1868).
- Existence of the Shoshone-Paiute Tribes Executive Order.
- Known prehistoric cultural resources and/or traditional use sites impacted by the SGP.
- Presence of traditional cultural properties\(^5\) (TCPs), cultural landscapes\(^6\) (CLs), sacred sites, and tribal resource collection areas that may be physically impacted by ground disturbance.
- Presence of TCPs, CLs, sacred sites, and tribal resource collection areas that may be impacted by visual intrusions caused by SGP components or an increase in audible elements (noise and vibrations).
- Changes in access to TCPs, CLs, sacred sites, and tribal resource collection areas due to the restricted access within the Operations Area Boundary.
- Changes to species viability and/or availability for tribal harvest of culturally important fish, wildlife, and plants.

1.10.1.4 **Wetlands and Riparian Resources**

Construction and operation of mine infrastructure may impact the quantity of wetland acres, impact ecological function, and fragment wetland habitat.

**Indicators:**

- Amount (acres) of wetland and riparian habitat permanently lost through construction of SGP components.
- Amount (acres) of wetland and riparian habitat temporarily lost through construction of SGP components.
- Functional units of high-value wetlands lost due to project construction, as demonstrated using functional assessment method.
- Acres of wetlands that would be affected by new or improved roads.
- Qualitative analysis of effects of wetland and riparian habitat fragmentation in affected areas.
- Amount (acres) of wetlands that would be within the footprint of groundwater drawdown.

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\(^5\) A TCP, as defined in the NHPA, is a property that is eligible for inclusion on the National Register of Historic Places (NRHP) “because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history and are important in maintaining the continuing cultural identity of the community” (Parker and King 1998).

\(^6\) A CL is defined as a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values. CLs are generally one of four types: vernacular, designed, historic site, or ethnographic (NPS 2021).
• Qualitative analysis of estimated changes in water quality parameters based on predictive water modelling in wetland areas.

1.10.1.5 Access and Transportation

Construction and operation of mine infrastructure may impact public access to NFS lands and affect travel routes within the SGP area.

Indicators:

• Number, location, and description of changes in access due to new and improved roadways.
• Amount of new road (miles).
• Change in amount of use (number of trips).
• Changes to current status on motorized mixed use of routes.

Construction, operation, and reclamation may affect traffic volumes, types of vehicles, and patterns of use. Further, it may affect access to public lands as well as public safety during mine construction, operations, and closure and reclamation.

Indicators:

• Miles of roads used by mine vehicles.
• Change in traffic volume.
• Potential number of accidents, both current and projected.
• Change in emergency access.
• Assessment of effectiveness of design features designed to prevent accidents.

1.10.2 Important Resource Related Issues

Other important issues were developed from scoping comments along with Forest Service and cooperating agency review. Though these issues were not identified as ‘significant issues’, they were identified by the public, the Forest Service, and cooperating agencies as relevant considerations. These other important issues help to focus the analysis of environmental effects to the physical, biological, and social resources under consideration. Like significant issues, other important issues use indicators to measure and compare potential effects. Table 1.10-1 presents other important issues discussed in greater detail in Chapter 4.
Table 1.10-1 Important Resource Related Issues

<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
</tr>
</thead>
</table>
| Geologic Resources and Geotechnical Hazards | • The minerals present at the site are economically valuable and may contribute to the national goal of being economically independent in strategic metals, such as antimony.  
• Mining activities could change the existing topography and leave physical hazards if not properly designed and managed.  
• Geological and geotechnical stability of the SGP facilities, including the TSF and other mine components. | • Amount and value of ore extracted (million tons/$).  
• Depletion of mineral resources (million tons).  
• Alteration of natural topography.  
• Unstable slopes.  
• Geological/Geotechnical suitability of the selected locations for the mining and facilities to be constructed.  
• Long-term geologic/geotechnical stability of the proposed structures. | Geologic Resources and Geotechnical Hazards                                                                                   |
| Air Quality                      | • The SGP may affect air quality characteristics and resources that are affected by air pollutants.                                                                                                           | • Geographical extent of pollutant concentrations and deposition.  
• Type and volume of air pollutants emitted, including haze precursors, airborne dust, and hazardous air pollutants (HAP). (tons per year)  
• Criteria air pollutant ambient air concentrations outside the Operations Area Boundary anywhere the public is allowed unrestricted access.  
• Comparison of predicted ambient concentrations to Class I and Class II increments and Significant Impact Levels.  
• HAPs (including mercury [Hg]) emissions and Hg deposition.  
• Deposition of nitrogen and sulfur compounds in Class I and specified Class II areas.  
• Near-field plume blight and far-field regional haze in protected areas. | Air Quality                                                                                                                      |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
</tr>
</thead>
</table>
| Climate Change            | • The SGP activities could contribute to factors that influence climate change.  
• Changing climatic conditions, in synergy with the SGP (including construction, operations, and closure and reclamation), could impact the physical, biological, and social resources. | • Greenhouse Gas (GHG) emissions from SGP activities (construction, operations, and closure and reclamation), expressed as metric tons (MT) of carbon dioxide (CO₂) equivalent (CO₂eq) of GHGs.  
• Changes in hydrologic patterns (drought, precipitation variability, and seasonality).  
• Changes in temperature (extreme heat/cold, or overall change in annual or seasonal temperatures).  
• Changes in extreme weather events (flash flooding, wildfires, severe storms). | Climate Change |
| Soils and Reclamation Cover Materials | • The SGP may result in long-term adverse impacts to soil resources.  
• Available reclamation cover material (RCM) may not be of sufficient quantity or quality to achieve reclamation objectives of returning disturbed areas to productive conditions that sustain long-term wildlife, fisheries, land, and water resources. | • Amount of (acres) and proportion of the TSRC activity area that are converted from a productive site to a non-productive site (as defined in the both the Payette Forest Plan and Boise Forest Plan).  
• Amount of (acres) and proportion of detrimental soil disturbance (DD) activity area that have altered soil characteristics resulting in a loss of productivity and altered soil-hydrologic conditions (as defined in both the Payette and Boise Forest Plans).  
• Volume of RCM available (bank cubic yards [BCY]) for reclamation compared to expected demand to achieve reclamation objectives.  
• Quality and suitability of RCM available for reclamation. | Soils and Reclamation Cover Materials |
| Noise                     | • The SGP may cause disturbance to Noise Sensitive Receivers (NSRs) such as occupied residences and campgrounds. | • Noise exceeds 55 decibels (dB) on the A-weighted scale (dBA) day-night noise level (L_DN) at the exterior use area of an NSR, or 55 dBA average hourly noise level (L_EQH) at any time at an exterior use area.  
• Noise exceeds 45 dBA L_DN at the interior portion of a residential NSR.  
• Noise causes the baseline outdoor ambient (i.e., existing) noise level to increase by more than 5 dBA in the vicinity of an NSR.  
• Noise causes the resulting indoor or outdoor ambient noise level to exceed 60 dBA equivalent sound level (L_EQ). | Noise |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Materials</td>
<td>• The SGP may cause accidental releases of hazardous materials or wastes, including diesel fuel, gasoline, lubricants, antifreeze, chemical reagents and reactants (including sodium cyanide and sulfuric acid), antimony concentrate, mercury containing residuals, lime, explosives and other substances during their transport, use, storage, or disposal.</td>
<td>• Volumes (gallons, truckloads, tons) and types of hazardous materials and hazardous wastes transported, used, and stored during site operation. • Practices for storage and use on site including primary/secondary/tertiary containment types and volumes and material handling practices. • Amount of vehicular transport (trips) of hazardous materials during construction, operations and closure and reclamation. • Travel routes and road conditions (such as terrain, proximity to water bodies, geohazard risk, etc.).</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Vegetation (General Vegetation Communities, Botanical Resources, and Non-native Plants)</td>
<td>• The SGP may impact forested Potential Vegetation Groups (PVGs) within Forest Service-administered land and could impact the ability of these areas to reach desired conditions. • The SGP may impact non-forested areas (i.e., those that are identified through PVG mapping as not being successional to forests) within Forest Service-administered land and could impact the ability of these areas to reach desired conditions. • The SGP may impact vegetation outside the boundaries of the Forests. • The SGP may impact known occurrences of Regional and Forest-specific designated sensitive and forest watch plant species. • The SGP may result in a direct loss of modeled potential habitat.</td>
<td>• Amount of disturbance (acres) to previously undisturbed forest PVGs within Forest Service-administered land. • Amount of disturbance (acres) to previously undisturbed non-forested areas within Forest Service-administered land. • Amount of disturbance (acres) in previously undisturbed Landscape Fire and Resource Management Planning Tools Project (LANDFIRE) existing vegetation types outside Forest Service boundaries. • Presence of known occurrences of sensitive or forest watch plant species or occupied habitat within 300 feet of the disturbance area. • Amount of modeled potential habitat (acres) for Regional and Forest-specific designated sensitive and forest watch plant species disturbed by the SGP. • Amount (acres) of land disturbed by the SGP. • Amount (acres) of vegetation removal in modeled potential habitat for whitebark pine. • Amount (acres) of whitebark pine occupied habitat impacted by the SGP. • Estimated number of mature whitebark pine trees to be cut during SGP construction. • Acres of habitat for whitebark pine known occurrences that would be directly impacted.</td>
<td>Vegetation (General Vegetation Communities, Botanical Resources, and Non-native Plants)</td>
</tr>
<tr>
<td>Resource</td>
<td>Issues</td>
<td>Indicators</td>
<td>SDEIS Sections Where Resources are Described and Impacts are Addressed</td>
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</tbody>
</table>
| Wildlife and Wildlife Habitat (Including Threatened, Endangered, Proposed, and Sensitive Species) | • The SGP may cause changes in wildlife habitat in the analysis area that may affect wildlife species including special-status species (threatened, endangered, Management Indicator Species, and sensitive species).  
  • The SGP may affect wildlife by introducing barriers to movement, including the mine site, infrastructure, new/existing maintained roads, new transmission line.  
  • The SGP may affect wildlife by potentially increasing the risk of direct injury or mortality. | • Amount (acres) of general wildlife habitat disturbed.  
  • Amount (acres) of special-status wildlife habitat disturbed.  
  • Amount (acres) of disturbance to other high-value habitats such as crucial and or high-value big game ranges, wetlands, and seep and spring areas.  
  • Change in noise levels (dB) in, or in proximity to, wildlife habitat.  
  • Amount (acres) of new road disturbance for the SGP.  
  • Amount (acres) of disturbance for new and upgraded transmission lines.  
  • Length (miles) of potential movement barriers.  
  • Amount of increased traffic along the access routes, or acres of ground disturbance for less-mobile species.  
  • Miles of new roads and transmission lines.  
  • Miles of existing roads that are not currently plowed that would be plowed. | Wildlife and Wildlife Habitat (Including Threatened, Endangered, Proposed, and Sensitive Species) |
| Timber Resources | • The SGP may change the availability of timber resources, including sawtimber and special forest products. | • Volumes and acres of timber resources removed.  
  • Acres of timberland (including land suited for timber production) converted to other, non-productive land uses.  
  • Miles or acres of new or changed rights-of-way (ROWs) or easements, regardless of jurisdiction. | Timber Resources |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
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</thead>
<tbody>
<tr>
<td>Land Use and Land Management</td>
<td>• The SGP would cause changes in or create new ROWs or easements.</td>
<td>• Miles or acres of new or changed ROWs or easements, regardless of jurisdiction.</td>
<td>Land Use and Land Management</td>
</tr>
<tr>
<td></td>
<td>• The SGP would cause changes in land use or land management.</td>
<td>• Acres of land used for SGP components by land management agency.</td>
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<td></td>
<td></td>
<td>• Acres of total and new land disturbance within SGP area.</td>
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<tr>
<td>Heritage Resources</td>
<td>• The SGP would impact historic properties through temporary or permanent ground disturbing activities during construction, operation, and closure and reclamation phases.</td>
<td>• Location and acres of ground disturbance.</td>
<td>Heritage Resources</td>
</tr>
<tr>
<td></td>
<td>• The SGP may impact aboveground historic properties, TCPs, and CLs by introducing visual elements that could diminish the integrity of the resources.</td>
<td>• Number and location of historic properties, including TCPs and CLs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The SGP would create noise and vibration that could impact fragile standing or partially standing historic properties, TCPs, and CLs.</td>
<td>• Significance of historic properties that could be displaced, damaged, or destroyed.</td>
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<tr>
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<td>• The SGP may create increased visibility of historic properties through increased public access via new roadways and improvements to existing roads, which could potentially lead to loss or destruction.</td>
<td>• Locations of tall or massive SGP components in relation to aboveground historic properties, TCPs, and CLs.</td>
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<td></td>
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<td>• Number and location of aboveground historic properties, TCPs, and CLs that may have altered viewsheds.</td>
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<td>• Vibration causing activities, including very high noise levels, and the locations of activities.</td>
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<td></td>
<td></td>
<td>• Number and location of standing or partly standing historic properties, TCPs, and CLs in relation to noise and vibration causing activities.</td>
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<td>• Location of public access roads that would be improved, constructed, and remain in use following mine closure and reclamation.</td>
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<td></td>
<td></td>
<td>• Number and location of historic properties, including TCPs and CLs, that may be impacted.</td>
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<tr>
<td>Resource</td>
<td>Issues</td>
<td>Indicators</td>
<td>SDEIS Sections Where Resources are Described and Impacts are Addressed</td>
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</tbody>
</table>
| Public Health and Safety | • The SGP may affect public safety on the roads used by mine vehicles during construction, operation, and closure activities.  
• The SGP may affect human health or exposure to hazards.  
• The SGP may affect infrastructure and services as related to emergency services, medical services, utilities, sanitation, and wastewater treatment.  
• The SGP may cause public health effects related to changing environmental conditions. | • Number of SGP-related vehicles trips on public roads.  
• Changes in health metrics such as soil, air, and water quality.  
• Quantity of hazardous materials transported on access roads.  
• Risk of natural hazards (wildfire, avalanche, landslide).  
• Capacity of existing infrastructure and services to meet anticipated increased use.  
• Changes in soil, air, fish consumption, and water quality that may affect public health.  
• Disruption at recreational areas during construction, operation, and closure and reclamation. | Public Health and Safety |
| Recreation        | • The SGP may cause changes to recreation setting, access, facilities, and/or opportunities. | • Changes in motorized access (including restrictions and/or changes in maintenance) to recreation opportunities. (miles)  
• Changes in recreation physical setting characteristics and related Recreation Opportunity Spectrum (ROS) class (by season) measured in acres.  
• Changes in recreation facilities (trails, campgrounds, trailheads), including the level of development and setting.  
• Changes in recreation use. (qualitative)  
• Changes in recreation special use permits.  
• Changes in recreation opportunities available.  
• Changes in the ability to participate in recreation opportunities. | Recreation |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
</tr>
</thead>
</table>
| Social and Economic Conditions | • The SGP may impact the socioeconomics of Valley and Adams counties and the State of Idaho. | • Contributions to employment levels (total, State of Idaho, and Valley and Adams counties).  
• Estimated value (dollars) of local income contributions.  
• Estimated value (dollars) of goods and services procured in Valley and Adams counties.  
• Change in populations of Valley and Adams counties.  
• Impacts to housing demand in Valley and Adams counties.  
• Estimated tax revenue contributions (dollars).  
• Changes in tourism and recreational based businesses.  
• Changes in transportation and infrastructure. | Social and Economic Conditions |
| Environmental Justice          | • The SGP may disproportionately impact minority or low-income populations. | • Number and size of minority populations affected.  
• Number and size of low-income populations affected.  
• Location of SGP facilities, including roads and transmission lines in relation to minority or low-income residents.  
• Differences in access to public lands.  | Environmental Justice |
| Inventoried Roadless Areas (IRAs) | • The SGP may impact roadless characteristics and wilderness attributes in IRAs and lands contiguous to unroaded areas. | • Miles and acres of roads in IRAs or contiguous unroaded lands.  
• Number and acres of proposed SGP facilities in IRAs or contiguous unroaded lands. | Special Designations |
| Wilderness                     | • The SGP could change the quality of wilderness character in designated or recommended wilderness areas. | • Distance (miles) of SGP facilities from designated or recommended wilderness.  
• Distance (miles) of designated or recommended wilderness from sights and sounds of human activity.  
• Change in opportunities for self-reliant recreation within designated or recommended wilderness. | Special Designations |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Issues</th>
<th>Indicators</th>
<th>SDEIS Sections Where Resources are Described and Impacts are Addressed</th>
</tr>
</thead>
</table>
| Wild and Scenic Rivers (WSRs)  | • The SGP may affect WSRs.                                             | • Changes to free-flowing conditions for eligible and suitable WSR segments.  
• Changes in water quality for eligible and suitable WSR segments.  
• Changes to Outstandingly Remarkable Values (ORVs) for which eligible and suitable WSR segments are designated or nominated.  
• Changes to classification of eligible and suitable WSR segments as Wild, Scenic, or Recreational. | Special Designations                                                                                                           |
| Research Natural Areas (RNAs)  | • The SGP could impact research values or ecosystem conditions within RNAs. | • Change in vegetation community composition and structure within an RNA.  
• Change in number of vehicles using roads and human activity.  
• Changes to water quality (chemistry, temperature) or quantity within an RNA. | Special Designations                                                                                                           |
| Scenic Resources               | • The SGP may cause changes to scenic resources.                       | • Visual contrast.  
• SGP component visibility.  
• Change in landscape character and scenic quality of the analysis area.  
• Change in distance zone.  
• Change in nighttime lighting.  
• Context of impacts, including that directed by forest plan standards and guidelines.  
• Change in scenic integrity. | Scenic Resources                                                                                                              |
1.10.3 Issues Eliminated and Dismissed from Additional Analysis

NEPA regulations require the agency to identify and eliminate from detailed study those issues that are not significant or that have been covered by prior environmental review, to narrow the scope of the analysis. Reasons for eliminating issues from detailed study include when the issues are related to the following:

- General opinions or position statements not specific to the Proposed Action;
- Items addressed by other laws, regulations, or policies;
- Items not relevant to the potential effects of the Proposed Action, or otherwise outside the scope of this analysis; and/or,
- Items that have no or negligible effects.

1.10.3.1 Changes to the General Mining Law of 1872

Comments received suggested that reforming or changing the Mining Law, as amended, would address potential future environmental impacts. While the Mining Law is fundamentally a law for acquiring property rights, rather than an environmental law, presumably the comments were directed at eliminating the ability to establish property rights and increasing agency discretion to prevent mining. This is dismissed from consideration because making or amending law is an explicit function of Congress and not within the authority of the Secretary of Agriculture.

1.10.3.2 36 CFR Part 251 Land Uses

Comments received questioned why the proposal was not being evaluated for issuance of a special use permit under the 36 CFR 251 Subpart B regulations. The U.S. mining laws (30 USC 21-54) govern exploration and development of minerals on public lands and the Forest Service is responsible for approving plans for such use and occupancy of NFS lands for locatable mineral operations pursuant to 36 CFR 228 Subpart A. As proposed, SGP is a locatable minerals operation authorized by the U.S. mining laws and subject to regulations at 36 CFR 228 subpart A. Pursuant to 36 CFR 251.50(a), such operations are not subject to 36 CFR 251 Subpart B.

1.10.3.3 Executive Orders

Comments received stated opinions that Forest Service should either comply or ignore certain executive orders, such as Executive Order (EO) 13766 (Expediting Environmental Reviews and Approvals for High Priority Infrastructure Projects), 13807 (Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects), and EO 13927 (Accelerating the Nation’s Economic Recovery from the COVID-19 Emergency by Expediting Infrastructure Investments and Other Activities). These EOs were revoked by EO 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis). Forest Service complies with the requirements of valid EOs when completing NEPA and implementing processes.
1.10.3.4 **Wild and Scenic Rivers**

Comments received stated that if the SGP might jeopardize the eligibility for WSRs designation for a certain river, and the WSR evaluation was not already completed as part of land use planning, a site-specific analysis is required. Eligibility studies have already been conducted. In 1997, the need for a WSR eligibility study on forest lands based on new information and changed conditions was identified and then conducted. The WSR Act states that, in order to be eligible, a river segment must be free-flowing (free of impoundments or diversions) and contain at least one ORV. During this process it was determined that Burntlog Creek was eligible as a recreational segment from the headwaters to the crossing with FR447 and wild from FR447 to the confluence with Johnson Creek with fish as the ORV. Johnson Creek was determined as eligible as a recreational segment with heritage as the ORV.

The South Fork Salmon River (SFSR) was determined as suitable and recommended for designation as a WSR by the BNF and PNF (Forest Service 2003a: Appendix J WSR Suitability Study Report). The ORVs for the recreational segment within the analysis area are botanical, scenic, geology, heritage, and recreation.

Existing or new mining activity on a Forest Service-identified WSR eligible or suitable river segment are subject to regulations in 36 CFR part 228 Subpart A and must be conducted in a manner that minimizes surface disturbance, sedimentation, pollution, and visual impairment (FSH 1909.12, Chapter 84.3). The heritage analysis ([Section 4.17](#)) identified that there would be no adverse effect to the historic transmission line (Line 328), which is the historic property that would be potentially affected along the eligible segment of Johnson Creek. Other historic properties along this segment would be avoided during the transmission line upgrade. There would be no impact to the heritage ORV along this segment. The fish ORV would not be adversely affected associated with the segments of Burntlog Creek identified as eligible as wild or recreational. There is no impairment to the free-flowing characteristics of either segment.

Further, comments stated that a Section 7 analysis under the WSR Act is required to determine whether the SGP would impair the free-flowing character of any impacted WSR. A Section 7 analysis is only completed for a designated WSR; none of the streams or rivers in the analysis area are designated WSRs. Further, a Section 7 analysis is conducted for federal water resources projects (i.e., located below the ordinary high-water mark); therefore, it is not applicable to the SGP.
2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

Chapter 2 describes the action proposed by Perpetua in its 2021 MMP submitted in October 2021 (Perpetua 2021a), an additional alternative utilizing another access route, and the No Action Alternative. Each alternative (including the No Action Alternative) would result in different environmental effects, which are analyzed in detail in Chapter 4. In addition, Section 2.6 includes a discussion of other alternatives considered but eliminated from further analysis. Section 2.7 summarizes the Agency Preferred Alternative. Section 2.8 concludes with a comparative summary of the environmental effects.

2.2 Development of Alternatives

2.2.1 Regulatory Setting for Alternatives Development

Alternatives were developed by the Forest Service and the USACE, with input from other cooperating agencies, guided by the NEPA, CWA, and U.S. Department of Agriculture Forest Service regulations (40 CFR 1502.14, 40 CFR 230, and 36 CFR 220.5, respectively), Forest Service Region 4 guidance, and the FSH. The Organic Administration Act, and Forest Service regulations at 36 CFR 228 Subpart A, governing mineral development on NFS lands also provided guidance regarding alternatives development.

2.2.2 Alternatives Screening Criteria

As used in this EIS, an action “alternative” is a complete package of operations, activities, and facilities that comprise a functioning mine project. A complete mining plan has several “component” parts, each necessary to allow production. In many instances, operational components may be further comprised of “subcomponents.” To develop a range of reasonable alternatives, Perpetua’s plan of operations, as supplemented by additional information and clarifications, was separated into components and subcomponents.

Public comments received during scoping provided early input into potential alternatives to the proposed SGP. An iterative review by the Forest Service and cooperating agencies, evaluated these comments to determine whether they were reasonable alternatives to the proposed SGP using four basic screening criteria described below. In addition to alternatives suggested during scoping, the Forest Service, cooperating agencies, and Perpetua also completed an alternatives development and review process. This process incorporated a review of the Plan and included consideration of alternatives Perpetua had already evaluated prior to the submission of their Plan (Midas Gold 2016a, Appendix G). Potential alternatives and component options were screened based upon four criteria:

1. Does the alternative, including a combination of component options, meet the purpose and need of the SGP?
2. Would the alternative or component option potentially reduce environmental effects to at least one resource?

3. Is the alternative or component option technically feasible?

4. Is the alternative or component option economically feasible?

Options not meeting the purpose and need (Section 1.6) were documented and eliminated first. Each remaining option was then evaluated for technical and economic feasibility and potential environmental impacts using the significant impact issues identified through the scoping process (Section 1.10). Infeasible options or options lacking any environmental benefit over the Proposed Action were then eliminated. In addition, options similar in design to an alternative that was carried forward into detailed analysis were screened out to avoid duplication. Section 2.6 provides additional discussion of specific component alternatives and options that were considered but eliminated.

Further review of alternatives after consideration of comments on the DEIS and submittal of a 2021 MMP by Perpetua eliminated certain action alternatives considered in the DEIS (Section 2.6).

Project refinements included in the 2021 MMP: (1) are supported by updated data and analysis that identify opportunities to reduce potential environmental impacts; (2) further ameliorate potential environmental impacts; (3) are informed by public and agency comments on the DEIS, and; (4) align with the NEPA, and all applicable federal, State, and local regulations and permit requirements.

### 2.2.3 Alternatives Overview

As described below, there are two action alternatives and the No Action Alternative. In general terms, these alternatives are:

**No Action Alternative** – The No Action Alternative provides an environmental baseline for comparison of the action alternatives. Under the No Action Alternative, the mining, ore processing, and related activities under the action alternatives, including removal of legacy materials, would not take place. However, existing, and approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue and Perpetua would not be precluded from subsequently submitting another plan of operations for consideration and evaluation pursuant to the General Mining Law of 1872.

**2021 MMP** – The 2021 MMP is based upon Perpetua’s Modified Plan of Operations submitted in October 2021 for the SGP. For access, the 2021 MMP would utilize Warm Lake Road, Johnson Creek Road, and Stibnite Road (comprising the Johnson Creek Route) during construction of the Burntlog Route, then utilize the Burntlog Route for the last year of construction of the mine site through operations and reclamation. The 2021 MMP primarily refines the open pit mining, pit backfill, water management, and closure aspects of the project compared to earlier Plan of Operations submittals.

**Johnson Creek Route Alternative** – The Johnson Creek Route Alternative was developed by the Forest Service and the cooperating agencies to evaluate potential reductions from access related effects. The mining portion of this alternative would be the same as the 2021 MMP. Therefore, the primary focus of the Johnson Creek Route Alternative is consideration of using an existing route, which would require
improvements, for mine access during operations and reclamation instead of a route that under the 2021 MMP requires new road construction in and through IRAs.

### 2.2.4 Components Common to and Primary Differences Between the Action Alternatives

The following mine components would be common to the two action alternatives:

- Mine pit locations, areal extents, and mining and backfilling methods
- Transportation management on existing and proposed roads
- Pit dewatering, surface water management, and water treatment
- Ore processing
- Lime generation
- Tailings Storage Facility (TSF) construction and operation
- TSF Buttress construction methods
- Water supply needs and uses
- Management of mine impacted water and stormwater runoff
- Electrical transmission lines
- Stibnite Gold Logistics Facility (SGLF)
- A road maintenance facility
- Surface and underground exploration
- Stibnite Gold Project worker housing facility

These mine components are described under the 2021 MMP and would remain the same under the Johnson Creek Route Alternative. **Table 2.2-1** provides a summary of the differences between the action alternatives. Because **Table 2.2-1** describes primary differences, not all the components listed above are included in the table.
<table>
<thead>
<tr>
<th>SGP Phase</th>
<th>Component/Subcomponent</th>
<th>2021 MMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Phases</td>
<td>SGP timeline</td>
<td>• Construction: Approximately 3 years.</td>
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<td>• Operations: Approximately 15 years.</td>
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<td>• Exploration: Approximately 17 years (during construction and operations).</td>
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<td>• Reclamation: Approximately 5 years (except for the TSF which would require an additional 9 years for tailings dewatering and consolidation).</td>
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<td>• Closure/Post-Closure Water Treatment: Approximately through Mine Year 40.</td>
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<td>• Environmental Monitoring: As long as needed.</td>
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<td></td>
<td>Access Roads</td>
<td>Construction/Operations:</td>
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<tr>
<td></td>
<td></td>
<td>• Warm lake road from State Highway (SH) 55 to Johnson Creek Route intersection (34 miles).</td>
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<td>• Johnson Creek Route for SGP access during early construction with minor improvements within the road prism.</td>
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<tr>
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<td></td>
<td>• Burntlog Route (38 miles) for SGP access during last year of construction, mining and ore processing operations, and closure and reclamation. Includes improvements of existing segments (23 miles) and road construction for new segments (15 miles).</td>
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<td></td>
<td>• Up to eight borrow areas developed along Burntlog Route for materials needed for road improvements and maintenance.</td>
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<td>• Access route around the Yellow Pine pit for public access.</td>
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<td>Closure and Reclamation:</td>
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<td></td>
<td>• New sections of Burntlog Route to be reclaimed after the closure and reclamation period.</td>
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<tr>
<td></td>
<td>Access Roads</td>
<td>Construction/Operations:</td>
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<td></td>
<td></td>
<td>• Warm lake road from SH 55 to Johnson Creek Route intersection (34 miles).</td>
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<td>• Johnson Creek Route (39 miles: Johnson Creek Road 25 miles, Stibnite Road 14 miles) upgraded and used for access throughout life of mine (LOM) instead of the Burntlog Route.</td>
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<tr>
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<td></td>
<td>• Access route around the Yellow Pine pit for public access, employee access, and deliveries of supplies and equipment to the processing, warehouse, worker housing facility, and administration areas.</td>
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<td>• No improvements or construction of new segments for Burntlog Route.</td>
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<td></td>
<td>• Up to seven borrow sources developed along the Johnson Creek Route for materials needed for road improvements and maintenance.</td>
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<td>Closure and Reclamation:</td>
</tr>
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<td></td>
<td>• Improved Johnson Creek and Stibnite roads would not be reclaimed to pre-existing conditions.</td>
</tr>
</tbody>
</table>

Same as 2021 MMP except:

- Construction: Approximately 5 years (upgrading the existing Johnson Creek and Stibnite Roads to provide permanent mine access).
<table>
<thead>
<tr>
<th>SGP Phase</th>
<th>Component/Subcomponent</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Phases</td>
<td>Public Access</td>
<td>Construction:</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Temporary groomed over-snow vehicle (OSV) trail on the west side of Johnson Creek from Trout Creek to Landmark while Burntlog Route is constructed (8 miles).</td>
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<tr>
<td></td>
<td></td>
<td>• OSV trail on west side of Johnson Creek from Wapiti Meadows to Trout Creek campground closed during construction (9 miles).</td>
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<tr>
<td></td>
<td></td>
<td>• OSV trail from Warm Lake to Landmark closed during construction through operations (8.5 miles).</td>
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<td></td>
<td>• Cabin Creek Road Groomed OSV trail (11 miles).</td>
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<td>• Public roads remain open through the SGP with temporary closures as needed to accommodate construction.</td>
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<td>Operations:</td>
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<td></td>
<td></td>
<td>• Groomed OSV trail moves from west side of Johnson Creek Road to Johnson Creek Road from Landmark to Wapiti Meadows (16.7 miles).</td>
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<td></td>
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<td>• Stibnite Road (County Road [CR] 50-412) / Thunder Mountain Road (FR 50375) closed through the SGP.</td>
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<td></td>
<td>• Seasonal public access through the Operations Area Boundary provided by constructing new road through Yellow Pine pit and below mine haul road to link Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375).</td>
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<tr>
<td></td>
<td></td>
<td>• Public access allowed on Burntlog Route to Thunder Mountain Road (FR 50375).</td>
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<tr>
<td></td>
<td></td>
<td>Closure and Reclamation:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• New road constructed over the Yellow Pine Backfill (backfilled Yellow Pine pit) connecting Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction and Operations:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as 2021 MMP except:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• OSV trail on the west side of Johnson Creek from Wapiti Meadows to Trout Creek campground would be closed from construction through mine closure (9 miles).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Groomed OSV trail on the west side of Johnson Creek from Trout Creek to Landmark lasting from construction through mine closure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closure and Reclamation:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as 2021 MMP.</td>
<td></td>
</tr>
<tr>
<td>SGP Phase</td>
<td>Component/Subcomponent</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Operations</td>
<td>Utilities – Transmission Lines</td>
<td>• Upgrade approximately 63 miles of the existing 12.5 kilovolt (kV) and 69 kV transmission lines. &lt;br&gt;• New approximate 9-mile, 138 kV line would be constructed from the Johnson Creek substation to a new substation at the mine site. &lt;br&gt;• Upgrade the substations located at Oxbow Dam, Horse Flat, McCall, Lake Fork, and Warm Lake. &lt;br&gt;• Reroute approximately 5.4 miles of transmission line to avoid the Thunder Mountain Estates subdivision. &lt;br&gt;• Reroute approximately 0.9 miles of transmission line between Cascade and Donnelly to use an old railroad grade on private property. &lt;br&gt;• Installation of approximately 3 miles of new underground distribution line along Johnson Creek Road from the Johnson Creek substation south to Wapiti Meadows.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Operations</td>
<td>Utilities - Communication Towers and Repeater Sites</td>
<td>• One cell tower located north of the Hangar Flats pit. &lt;br&gt;• Locations along Burntlog Route for very high frequency (VHF) repeater sites. &lt;br&gt;• Use existing access roads to repeater site locations along Burntlog Route. &lt;br&gt;• Communication site at the SGLF. &lt;br&gt;• Upgrades to existing communication site.</td>
<td>Same as 2021 MMP except: &lt;br&gt;• Cell tower sites constructed and maintained using helicopter (instead of constructing access roads) for sites within IRAs managed for Backcountry/Restoration. &lt;br&gt;• Locations along Johnson Creek route for repeater sites.</td>
</tr>
<tr>
<td>Operations</td>
<td>Off-site Maintenance Facility</td>
<td>• SGLF located along Warm Lake Road. &lt;br&gt;• Burntlog Maintenance Facility located at one of the borrow source locations 4.4 miles east of the junction of Johnson Creek Road and Warm Lake Road along the proposed Burntlog Route.</td>
<td>• SGLF same as 2021 MMP &lt;br&gt;• Landmark Maintenance Facility located at junction of Warm Lake Road at Johnson Creek Road.</td>
</tr>
</tbody>
</table>
### 2.3 No Action Alternative

Under the No Action Alternative, the Plan would not be approved and no mining, ore processing, or related activities would occur, including removal of legacy materials (i.e., SODA and Hecla heap leach) included in the Plan. Previously approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue. In a reasonably foreseeable future action, certain legacy and existing mining impacts would be addressed as directed in the 2021 ASAOC described in Section 1.3, including installation of stream diversion ditches designed to avoid contact of water with sources of contamination and removal of approximately 325,000 tons of development rock and tailings that are currently impacting water quality. These CERCLA response actions would occur under all alternatives considered in this analysis. Under the No Action Alternative, Perpetua would not be precluded from subsequently submitting another plan of operations pursuant to the Mining Law to the Forest Service for subsequent evaluation.

### 2.4 2021 MMP

#### 2.4.1 Overview

The 2021 MMP, the revised Proposed Action, is based on the ModPRO2 (Perpetua 2021a). Mine operations would occur on patented mining claims owned or controlled by Perpetua and on unpatented mining claims and other areas of federal public lands comprised of NFS lands that are administered by the PNF. Supporting infrastructure corridors (access and transmission line) are located on the BNF, IDL, Bureau of Reclamation (BOR), and non-federal lands.

Perpetua proposes to develop a mine operation that produces gold and silver doré, and antimony concentrates from ore deposits associated with their mining claims in the SGP area. The estimated recoverable mineral resource consists of:

- 4.2 million ounces of gold
- 1.7 million ounces of silver
- 115 million pounds of antimony
Development of the mineral resource would include construction of access and haul roads; construction of supporting infrastructure; open pit mining; ore processing; placement of tailings in a TSF; and placement of development rock. New access to the SGP would be provided by the proposed Burntlog Route, which would be a combination of widening the existing Burnt Log Road (FR 447), Thunder Mountain Road (FR 50375), and Meadow Creek Lookout Road (FR 51290) and constructing new connecting road segments of approximately 15 miles (Figure 2.4-1). Development of the Burntlog Route would entail 340.9 acres of new cut and fill activity (including borrow sources) along existing and newly constructed roadways.

To provide electric power for the SGP, an existing powerline would be upgraded and a new transmission line from a new Johnson Creek substation to the mine would be constructed. Additional off-site support facilities to be constructed along access corridors include the SGLF and the Burntlog Access Route Maintenance Facility. The SGLF would house administrative offices, the assay laboratory, and a warehouse while the maintenance facility would be the headquarters for road maintenance and snow removal (Section 2.4.4.9). The proposed facilities and access roads are shown on Figure 2.4-1 and Figure 2.4-2. The Operations Area Boundary shown on Figures 2.4-1 and 2.4-2 is the boundary within which Perpetua would control public access.

The components of the 2021 MMP are described in the following sections in terms of overall land management and affected areas, and project phases: construction; operations; exploration; and closure and reclamation, including post-closure monitoring.

### 2.4.2 Land Management and Affected Areas

Table 2.4-1 provides a summary of land management or ownership by estimated SGP component for the maximum affected area proposed and also includes acreages of new disturbance and re-disturbance by SGP component and ownership.

### 2.4.3 Phases and Timeline

The actions proposed under the 2021 MMP would take place over a period of approximately 20 to 25 years, not including the long-term, post-closure environmental monitoring or potential long-term water treatment. The phases of the SGP are described in subsequent sections and include: (1) Construction (approximately 3 years; Mine Years -3 through -1); (2) Mining and Ore Processing Operations (approximately 15 years; Mine Years 1 through 15)); (3) Surface and Underground Exploration (approximately 17 years, beginning during construction and continuing concurrent with operations; Mine Years -2 through 15); and (4) Closure and Reclamation (Mine Year 16+). Most activities in the Closure and Reclamation period would be completed within five years. However, closure water management and water treatment are expected to continue for as long as 25 years (Mine Years 16 through 40). The environmental monitoring phase would continue for as long as needed to demonstrate that the site has been fully reclaimed. Figure 2.4-3 provides an illustration of the timing of construction and operations activities and the initiation of the closure phase.
Figure 2.4-1
SGP Overview and Location
Stibnite Gold Project
Stibnite, ID

<table>
<thead>
<tr>
<th>Forest Service Road Number</th>
<th>Road Name</th>
<th>Map Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR 447</td>
<td>Burnt Log Road</td>
<td>447</td>
</tr>
<tr>
<td>FR 467</td>
<td>Cabin Creek Road</td>
<td>467</td>
</tr>
<tr>
<td>FR 51290</td>
<td>McMillen Creek Lookout Road</td>
<td>51290</td>
</tr>
<tr>
<td>FR 474</td>
<td>South Fork Road (BNF)</td>
<td>474</td>
</tr>
<tr>
<td>FR 50674</td>
<td>South Fork Road (PNF)</td>
<td>50674</td>
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<tr>
<td>FR 440</td>
<td>Thunder Mountain Road (BNF)</td>
<td>440</td>
</tr>
<tr>
<td>FR 50375</td>
<td>Thunder Mountain Road (PNF)</td>
<td>50375</td>
</tr>
</tbody>
</table>

Surface Management:
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- U.S. Forest Service

Legend:
- Project Components
- SGP Features
- Operations Area Boundary
- Access Roads and Trail System
- Burnt Log Route *
- Johnson Creek Route
- Utilities
- Upgraded Transmission Line
- New Transmission Line
- Offsite Facilities
- Burnt Log Maintenance Facility *
- Landmark Maintenance Facility **
- Stibnite Gold Logistics Facility

Other Features:
- U.S. Forest Service
- Wilderness
- IRA and/or Forest Plan Special Area
- County
- City/Town
- Monumental Summit
- Airport/Landing Strip
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

* Associated with 2021 MNP only
** Associated with Johnson Creek Route Alternative only

Note:
The McCall – Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.
Figure 2.4-2
Mine Site Layout
Stibnite Gold Project
Stibnite, ID

Base Layer: Hillshade derived from LiDAR supplied by Midas Gold
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

LEGEND
Project Components
SGP Features
Pit Backfill
Growth Media Stockpile
Mining Pit
Laydown
Plant Site
TSF Buttress
TSF Liner
Alluvial Stockpile
Workers Housing
Stockpile
Explosive Facility
Patented Claim Boundary
Surface Drainage Area Boundary
Operational Claim Boundary
Water Diversion
Clean Water Diversion - Piped
Clean Water Diversion - Ground
East Fork South Fork Salmon River Tunnel
West Fork South Fork Salmon River Tunnel
Pond
Eldorado Lake
Main Gate
Haul Road
Radiator Pad
Burntlog Route
Johnson Creek Route
Cell Tower Access Road
Public Access Road
Access Roads
Utilities
Transmission Line
Substation
New Cell Tower
Existing Communication Tower
Other Features
U.S. Forest Service
Wilderness
IRA and Forest Plan Special Areas
Monumental Summit
Road

* Project Components are associated with all Alternatives
** Some surface water diversion diversions are not discernible at this figure scale (e.g., the diversions associated with the TSF/buttress north, Fiddle culvert, Midnight Outfall, Scout ROM). Please refer to Figures 2.4-14 and 2.4-15 which provide greater detail regarding the Water Management Plan and its facility/diversion locations.
*** The East Fork South Fork Salmon River Tunnel would only be utilized if a contingency to manage high flows upon completion of the restoration of the East Fork SFSR across the backfill in the Yellow Pine Pit.
**** Perennial streams are not depicted for the entire map area. Only perennial streams within the Operations Area Boundary are depicted.
***** Public Access Road associated with 2021 MMP
****** Substation locations are approximate.
**Construction Phase**
(Mine Year -3 through -1):
- Facility construction
- Road construction
- Pre-stripping

**Operation Phase**
(Mine Years 1 through 15):
- Ore processing
- Limestone production mining
- Yellow Pine production mining
- Pre-stripping for Hangar Flats
- Hangar Flats production
- Pre-stripping for West End
- West End production
- Bradley tailing production
- Stockpile re-handling

**Reclamation and Closure Phase**
(Mine Years 16 through 20):
- Reclamation of facilities

**Post Closure Water Treatment and Monitoring Phase**
(Mine Years 16 through 40):
- Site monitoring with collection and treatment of tailings consolidation water

---

**Figure 2.4-3**
Phases and Timeline

Stibnite Gold Project
Stibnite, ID

Data Sources: Perpetua 2021a
Table 2.4-1  Land Management and Acreage by Component for the 2021 MMP

<table>
<thead>
<tr>
<th>Component</th>
<th>Perpetua Private</th>
<th>Other Private</th>
<th>PNF</th>
<th>BNF</th>
<th>Salmon-Challis National Forest&lt;sup&gt;4&lt;/sup&gt;</th>
<th>BOR</th>
<th>IDL</th>
<th>Totals</th>
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</thead>
<tbody>
<tr>
<td>Mine Site</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>New Disturbance</td>
<td>48.2</td>
<td>0</td>
<td>767.9 + 65&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>881.1</td>
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<td>Re-disturbance</td>
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<td>0</td>
<td>402.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>859.0</td>
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<tr>
<td>Off-site Facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>New Disturbance</td>
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<tr>
<td>Re-disturbance</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
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<td>Access Roads</td>
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<td></td>
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<td></td>
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<tr>
<td>New Disturbance</td>
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<td>81.6</td>
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<td>8.7</td>
<td>0</td>
<td>0</td>
<td>144.5</td>
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<tr>
<td>Utilities&lt;sup&gt;1&lt;/sup&gt;</td>
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<td></td>
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<td>New Disturbance</td>
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<td>61.4</td>
<td>221.8</td>
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<td>350.6</td>
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<td>36.1</td>
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<td>590.1</td>
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<td>Disturbance Totals</td>
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<td></td>
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<tr>
<td>Total New Disturbance</td>
<td>75.4</td>
<td>105.9</td>
<td>910.9 + 65&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>5.5</td>
<td>3.5</td>
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<td>Total Re-disturbance</td>
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<td>178.5</td>
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<td>12.5</td>
<td>62.1</td>
<td>3,265.9&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a

<sup>1</sup> Utilities affected areas include both existing utility corridors and access routes, and new utility corridors and access routes. Some existing utility access routes would be upgraded.

<sup>2</sup> Approximately 65 affected acres associated with temporary surface exploration pads and roads (SGP component) have an unknown land ownership because the exact locations of these exploration areas are not yet known; however, these are included in the PNF SGP subtotal.

<sup>3</sup> Items, subtotals, and totals may not add up to grand total due to rounding.

<sup>4</sup> Approximately 14 acres of land is administered by the PNF but is within the boundary of the Salmon Challis National Forest.

BOR – Bureau of Reclamation; IDL – Idaho Department of Lands
2.4.4 Site Preparation, Access, and Infrastructure

2.4.4.1 Overview

Implementing the 2021 MMP would require construction of surface facilities, haul roads, and water management features. Supporting infrastructure would include transmission lines, substations, communication sites, and access roads. Additionally, removal of some features from past mining activities (legacy mining features) would be initiated during the construction phase. Perpetua would install 15 to 20 temporary trailers on private lands adjacent to the existing exploration camp (located in the proposed ore processing area) to accommodate construction crews; these temporary trailers would be used during site preparation and early construction until the worker housing facility is constructed.

Prior to site preparation and construction of surface facilities, vegetation would be removed from operating areas. Trees, deadwood, shrubs, and slash would be removed, and any remaining vegetation would be grubbed using a bulldozer. The resulting material would be chipped and stockpiled for use as mulch or blended to create a growth media additive. After vegetation removal, growth media would be salvaged and stockpiled. Stockpiles would be stabilized and seeded.

The existing potable water supply system at the exploration camp would be used and expanded for the construction camp. The existing system would be supplemented with deliveries of potable water, if needed. Supplemental water sources (i.e., water deliveries) would be used by personnel in remote construction areas. Sanitation during construction would be provided through the existing sewage treatment system adjacent to the exploration camp. In addition, portable sanitary facilities would be located throughout the SGP and at remote construction areas.

Construction of the Burntlog Route would occur from both ends of the route at the same time on a seasonal basis (May to November), but construction could occur outside of this time period if conditions allow. The southern portion workforce would be housed in three temporary trailer camps located within construction borrow sources or staging areas. The northern portion workforce would be housed at the temporary trailer construction camp at the SGP. Some construction workers could be housed in Cascade, Idaho.

Pre-construction water management activities would include best management practices to reduce erosion and sediment delivery to streams. These water management features could include sedimentation ponds; run-on water diversion ditches, trenches, and/or berms; runoff water collection ditches; silt fence; water bars; culverts; energy dissipation structures; terraces; and other features specified in construction permits. In the second and third years of construction, mine contact water would be generated by stormwater runoff at the West End pit, Yellow Pine pit, TSF embankment, legacy Hecla heap leach, and the SODA, but would be contained as described in Section 2.4.5.10.
2.4.4.2 Growth Media Stockpiles

Suitable growth media within the area proposed for operations would be salvaged following vegetation clearing and moved to growth media stockpiles (GMSs) either within the Fiddle Valley or at the Worker Housing Facility. Other short-term GMSs would be located within the footprint of the TSF. Growth media from the new construction of the Burntlog Route would be stockpiled in the borrow source areas used for construction and widening of the route and in windrows along the edges of fill slopes. GMSs would be stabilized, seeded, and mulched to protect the stockpile from wind and water erosion.

To achieve the reclamation success criteria and offset the growth media deficits, 1.5 million BCY of unconsolidated overburden (chiefly alluvial and glacial materials from Yellow Pine pit) would be stored in the Fiddle GMS to allow use as cover material for reclamation of the TSF, TSF Buttress, and Hangar Flats pit backfill.

2.4.4.3 Access Roads

Warm Lake Road

Warm Lake Road (CR 10-579) is a two-lane (one lane each direction), asphalt-paved roadway with lane markings open year-round to all vehicles from Idaho State Highway (SH) 55 to Warm Lake. The road starts in Cascade at an intersection with SH 55, which is a major north-south transportation corridor. This intersection would be used by all mine-related traffic through all phases of the SGP. The Warm Lake Road continues eastward for approximately 35 miles, ending at Johnson Creek Road (CR 10-413) at Landmark. Warm Lake Road is under the jurisdiction of Valley County. Currently, Valley County does not maintain Warm Lake Road in winter beyond Warm Lake Lodge. With adequate snowpack, an 8-mile segment of the Warm Lake Road route east of Warm Lake Lodge is used as an OSV route, allowing access into Landmark and points beyond.

SGP would need year-round passenger and delivery truck access from the onset of construction through the life of the mine. The Warm Lake Road is suitable for this use in its current condition. Perpetua would conduct wintertime maintenance east of Warm Lake Lodge to ensure safe, year-round access to the sole route of ingress/egress to the SGP for all mine support traffic. This would include snow removal and road sanding, as appropriate, to maintain a safe driving surface. Commitments for wintertime maintenance of Warm Lake Road would be documented in a Road Maintenance Agreement with Valley County.

Perpetua wintertime maintenance and use of Warm Lake Road would result in two changes to current traffic conditions:

- Warm Lake Road east of Warm Lake Lodge would not be available as a recreational OSV route from the start of construction through reclamation of the SGP. To replace this recreational use, a dedicated alternative OSV route would be established from the Warm Lake area to Landmark via the Cabin Creek/Trout Creek drainages and adjacent to the Johnson Creek Road. Establishing this replacement OSV route would minimize the interactions between SGP traffic and recreational traffic in the winter. The proposed OSV route is illustrated in Figure 2.4-4.
• Expanded wintertime public vehicle access on Warm Lake Road east of Warm Lake Lodge would commingle SGP and public travel.

Changes to the SH 55 and Warm Lake Road intersection would improve access for large trucks carrying equipment and supplies to the SGP and would facilitate turns from SH 55 onto Warm Lake Road and from Warm Lake Road back onto SH 55. Any changes proposed to the intersection would need to be approved and implemented by the Idaho Transportation Department (ITD). Recommended changes to the intersection include: the addition of left and right turning lanes (Parametrix 2018a); an intersection modification to accommodate larger trucks; potential relocation of two power poles (HDR Engineering, Inc. [HDR] 2017a); and a modification to the westbound approach at Warm Lake Road to improve the view of traffic coming from the north.

**Johnson Creek Route**

During the initial construction period of the Burntlog Route (approximately 2 to 3 years), mine-related traffic would access the SGP from SH 55, north of the city of Cascade, via Warm Lake Road for approximately 34 miles, then north on Johnson Creek Road (CR 10-413) for approximately 25 miles to the village of Yellow Pine, and from Yellow Pine east approximately 14 miles to the SGP via the Stibnite Road (CR 50-412). The portion of the route that includes Johnson Creek Road and Stibnite Road is known as the Johnson Creek Route. This route is primarily situated topographically adjacent to the valley bottom, paralleling Johnson Creek and then the East Fork SFSR.

Johnson Creek Road is a county-maintained, native-surface road that is open to vehicles with seasonal restrictions due to snow. During the winter, Valley County plows approximately 10 miles of Johnson Creek Road from Yellow Pine south to Wapiti Meadow Ranch and grooms the remaining 17 miles of Johnson Creek Road from Wapiti Meadow Ranch to Warm Lake Road at Landmark for OSV use. Valley County does not plow Warm Lake Road from Warm Lake to Landmark; this section is a designated groomed OSV route.

The Stibnite Road portion of the route is also a county-maintained native surface road, open to all vehicles with seasonal restrictions due to snow. This road is plowed in the winter by Perpetua through an agreement with Valley County. Stibnite Road connects to Thunder Mountain Road on the southeastern portion of the Stibnite site and currently provides seasonal (non-winter) public access through the site.
Figure 2.4-4
OSV Routes
Stibnite Gold Project
Stibnite, ID

Over Snow Vehicle Routes
- Cabin Creek Road OSV trail
- Cabin Creek to Johnson Creek OSV trail connector
- Johnson Creek Road OSV trail
- Parking area to USFS Warm Lake Project Camp OSV trail
- Trout Creek Campground north to Wapiti Meadows OSV trail
- Warm Lake area OSV connector
- Warm Lake to Landmark OSV trail
- OSV Parking Area

Other Features
- U.S. Forest Service
- Wilderness
- RIA and/or Forest Plan Special Area
- County
- City/Town
- Campground
- Airport/Landing Strip
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

OSV Route Length (mi)
- Trout Creek Campground north to Wapiti Meadows OSV trail 8.85
- Johnson Creek Road OSV trail (OSV Access during Construction) 0.14
- Johnson Creek Road OSV trail (OSV Access during Operations) 7.80
- Parking area to USFS Warm Lake Project Camp OSV trail 1.88
- Cabin Creek Road OSV trail 10.82
- Cabin Creek to Johnson Creek OSV trail connector 0.82
- Warm Lake area OSV connector 0.39
- Warm Lake area to Landmark OSV trail (Existing) 8.49

* Trout Creek Campground north to Wapiti Meadows would be closed for the duration of construction through closure and reclamation under the Johnson Creek Route Alternative.

Surface Management
Private
U.S. Forest Service

Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 1.5 miles
when printed at 11x17
Minor surface improvements (such as ditch and culvert repair, adding gravel, winter snow removal, resurfacing if required, and summer dust suppression) would occur on the Johnson Creek Route under the 2021 MMP to reduce sediment runoff and dust generation. However, there would be no road alignment modification or widening of these existing roads along the Johnson Creek Route. The road varies in elevation from approximately 4,750 to 6,700 feet amsl with an average grade of 1.5 to 2 percent with occasional local segments with grade up to approximately 8 percent.

Portions of Johnson Creek Road (i.e., Landmark to Wapiti Meadows) are currently used as a groomed OSV trail during winter and use of the Johnson Creek Route by mine-related construction traffic would conflict with this existing groomed OSV trail. Thus, while the Burntlog Route (described below) is under construction, a temporary 16-foot-wide groomed OSV trail adjacent to Johnson Creek Road between the proposed Cabin Creek Groomed OSV Route and Landmark would be constructed (Section 2.4.4.4 and Figure 2.4-4). However, the OSV trail from Trout Creek Campground to Wapiti Meadows would be closed until construction of the Burntlog Route is complete; once mine traffic moves to that route, then the OSV route would return to Johnson Creek Road and would reconnect Landmark with Wapiti Meadows.

Perpetua has an existing agreement with Valley County for maintenance of Johnson Creek and Stibnite roads, including performing maintenance measures to repair segments that have deteriorated. Appropriate revisions to the road maintenance agreement would be established for use of the Johnson Creek Route as a construction route and to ensure year-round access in accordance with Valley County’s public road easement stipulations. Once construction of the Burntlog Route has been completed (2-3 years), the Johnson Creek Route would no longer be used by mine-related traffic.

**Burntlog Route**

The Burntlog Route would connect the eastern end of Warm Lake Road (at Landmark) to the SGP (to the northeast) by widening and improving approximately 23 miles of existing roads, including the full length of the existing Burnt Log Road (FR 447) and segments of Meadow Creek Lookout Road (FR 51290) and Thunder Mountain Road (FR 50375). The three road segments would be connected with two new road segments totaling approximately 15 miles. Burnt Log Road is currently a native surface road that is open year-round to all vehicles with seasonal restrictions due to snow. The last 0.25 to 0.5 mile of the existing road is closed and motorized traffic prohibited. Meadow Creek Lookout Road is a native surface road, open year-round to all vehicles. The Burntlog Route is primarily situated topographically on mid-slopes and ridgeline.

Improvements on the existing roads that comprise the Burntlog Route include:

- Straightening tight corners to allow for improved safety and traffic visibility;
- Maintaining grades of less than 10 percent in all practicable locations;
- Placing sub-base material and surfacing with gravel;
- Application of a road binding agent in localized segments to suppress dust, increase stability, and reduce sediment runoff;
• Widening the existing road surface (currently approximately 12 feet wide) to a 21-foot-wide travel way (approximately 26 feet including shoulders); and

• Installing side-ditching, culverts, guardrails, and bridges, where necessary, with design features to provide fish passage and limit potential sediment delivery to streams.

**Figure 2.4-5** shows the proposed Burntlog Route, which includes the proposed new road construction. A segment of new road construction for the Burntlog Route would be located on the south side of the Riordan Creek drainage and cross Riordan Creek north of Black Lake. The approximately 5.3-mile road segment would have 12 stream crossings, three of which cross perennial streams. The elevation of this road segment is approximately 8,000 to 8,600 feet and the average grade of this road segment would be 5 to 6 percent. After construction is completed, public use would be allowed on Burntlog Route when other public access roads are blocked by mine operations.

The connection segment between the end of Burnt Log Road and Meadow Creek Lookout Road is approximately 11 miles and would cross Trapper Creek 0.5 miles east of the intersection of Trapper Creek Road (FR 440) and FR 440A and continue northeast towards Black Lake and on to the Meadow Creek Lookout Road. The second connector between the Meadow Creek Lookout Road and Thunder Mountain Road would be approximately 4 miles and links up with Thunder Mountain Road approximately 2 miles south of the SGP. Minor surface improvements (e.g., blading) would occur on the portions of the existing Thunder Mountain Road and Meadow Creek Lookout Road that would not become part of the Burntlog Route to provide a safe road surface for transportation of construction equipment required to build the Burntlog Route. There would be no road alignment modification or widening of the portions of the existing roads that are not part of the Burntlog Route.

Primary SGP access would shift from the Johnson Creek Route to the Burntlog Route near the end of the construction phase. The Burntlog Route would be compliant with all related usage and approval requirements included in 36 CFR Section 228, Part A. The Burntlog Route would avoid environmental and human health and safety risks associated with the Johnson Creek Route which passes through identified areas for avalanches, landslides, and floods. This route would provide another route for SGP ingress/egress, would decrease SGP and public traffic interaction with Yellow Pine and Johnson Creek area residents; and would decrease the potential for spill risk adjacent to fish-bearing streams. Upon completion, the Burntlog Route would serve as an alternative public access route to the Thunder Mountain area for the life of the mine until it is decommissioned following mine reclamation and closure.

**Burntlog Route Borrow Sources, Staging Areas, and Construction Camps**

Up to eight borrow sites would be established along the Burntlog Route (**Figure 2.4-5**) to meet construction and ongoing maintenance throughout the life of the mine and to support decommissioning following mine closure. Additionally, those same eight borrow areas would be utilized for staging of equipment and supplies. Three construction camps would be located within the disturbance created by borrow sources or staging areas. The construction camps would be for trailer parking. Each trailer would need to be equipped with fresh water and sanitary waste storage.
LEGEND
Project Components
SGP Features
Operations Area Boundary
Access Roads and Trail System
Burntlog Route Upgrade
Burntlog Route New
Burntlog Route Borrow Source
Offsite Facilities
Burntlog Maintenance Facility
Other Features
U.S. Forest Service
Wilderness
IRA and/or Forest Plan Special Area
County
City/Town
Monumental Summit
Airport/Landing Strip
Road
Stream/River
Lake/Reservoir

Figure 2.4-5
Burntlog Route
Stibnite Gold Project
Stibnite, ID

Surface Management
Private
U.S. Forest Service

Base Layer: USGS DEM, Elevation Program, USGS Earth Resources Observation & Science (EROS) Center
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 2 miles when printed at 11x17
2.4.4.4 Public Access

During construction of the SGP and completion of the Burntlog Route, to the degree practicable, the public would continue to have access on forest roads currently available to the public (Figure 2.4-1). However, current public access through the SGP on Stibnite Road would be restricted for a period of approximately one year while a new through-site public access road is constructed. A new 4-mile long, 12-foot-wide gravel road would be constructed to provide public access from Stibnite Road (FR 50412) to Thunder Mountain Road through the SGP (Figure 2.4-2). The road would be constructed on a widened bench on the west side within the Yellow Pine pit, then head south of the Yellow Pine pit, where this road would utilize an underpass to cross under a SGP haul road and continue southward, parallel to and on the east side of the mine haul road on a partially revegetated portion of a former haul road (Figure 2.4-2). Southwest of the ore processing area, the public access road would connect with Thunder Mountain Road and continue toward the worker housing facility, exiting the SGP to the southeast.

During operations, the public access road through the SGP would provide seasonal use, open to all vehicles; access would not be provided in winter when impassable (current county maintenance standards) and signs would inform the public of seasonal and temporary closures. Vehicles passing through the SGP would be required to check-in with mine personnel at the North or South SGP entry points and would receive a safety briefing and would also be required to check-out with SGP personnel upon exiting the SGP. For safety purposes, public access would be separated from other SGP roads by berms, security fencing, and the underpass to allow the public road to pass beneath the mine haul road. No stopping or deviating from the public access road would be allowed. Perpetua would restrict SGP access to any vehicles due to concerns related to public or employee health and safety, such as during road construction and maintenance, blasting, highwall scaling, mining in the immediate area of the road, and similar operations.

Public access would continue along Johnson Creek Road and Burnt Log Road. Total closures of half-day to multiple days could occur during construction work on Stibnite Road between the village of Yellow Pine and the SGP, part of Thunder Mountain Road, and Burnt Log Road.

Public use of the Burntlog Route would provide motorized access to Meadow Creek Lookout Road (FR 51290) and Monumental Summit. Other routes available for public use are shown on Figure 2.4-1.

Public access by foot via existing trails or on roads would be restricted within the Operations Area Boundary shown on Figure 2.4-2. Security personnel, fencing (including wildlife exclusion fencing), and signs would restrict public access to vehicular traffic on the designated public access roadway inside the Operations Area Boundary.

**Warm Lake to Landmark Groomed OSV Trail**

Due to year-round access to the SGP along the Burntlog Route, an existing, approximately 8.5-mile-long groomed OSV trail from Warm Lake to Landmark would be closed for the life of the SGP. To replace this recreational use, a dedicated alternative OSV route would be established from Warm Lake area to Landmark via the Cabin Creek/Trout Creek drainages and Johnson Creek Road (Figure 2.4-4).
Near Warm Lake, an approximately 2-acre parking area would be established west of South Fork Road on FR 474B. A new 3.2-mile groomer access trail would be established from the parking area to the Forest Service Warm Lake Project Camp south of Paradise Valley Road (FR 488) where the groomer would be stored. An approximate 0.1-mile segment would be groomed from the intersection of Paradise Valley Road and FR 488A to Warm Lake Road. The Cabin Creek Road (FR 467) portion of the groomed OSV trail would extend approximately 13 miles to the Trout Creek Campground on Johnson Creek Road. Portions of Cabin Creek Road would require stream crossing improvements, localized road widening, and surface grading to support the OSV route grooming equipment.

**Johnson Creek Groomed OSV Trail**

From Trout Creek Campground to Landmark, an approximately 8-mile temporary groomed OSV trail would be created and maintained on NFS lands adjacent to the west side of Johnson Creek Road (CR 10-413). Portions of the temporary groomed OSV trail would be established using a snowplow wing attachment requiring some vegetation and tree removal to allow for safe snowplowing. In areas where topography and vegetation prevent using the wing attachment to establish the groomed OSV trail, sections would merge with Johnson Creek Road. During construction, the OSV route would include an additional 0.34 of a mile segment east along the Warm Lake Road connecting Johnson Creek Road to Deadwood-Stanley Road (FR579) (Figure 2.4-4).

**Warm Lake Area OSV Connection**

A 16-foot-wide groomed OSV trail would be created and maintained north of Warm Lake Road to connect the southern end of the Cabin Creek Road OSV trail to the Warm Lake Road (FR 579). It would also provide access to North Shoreline Drive (FR 489) from the Cabin Creek Road OSV trail. This 0.3-mile route would be used throughout construction and operations and would require the removal of some vegetation and trees.

**Temporary OSV Closure Trout Creek Campground to Wapiti Meadows**

OSV access would be temporarily halted between Trout Creek Campground and Wapiti Meadows (about 9 miles north of Trout Creek Campground on Johnson Creek Road; Figure 2.4-4) for approximately 2 to 3 years during construction of the Burntlog Route. Once construction of the Burntlog Route has been completed, the Johnson Creek Route would no longer be used by mine-related traffic and the OSV route would be returned to the unplowed Johnson Creek Road and extended northward to provide approximately 17 miles of groomed OSV access between Landmark and Wapiti Meadows. Resumption of OSV access between Trout Creek Campground and Wapiti Meadows would occur following construction of the Burntlog Route.

**2.4.4.5 Traffic**

Traffic associated with SGP construction would occur year-round, depending upon road and weather conditions. Construction-related traffic and material hauling would be most concentrated from May through November, and personnel would be transported primarily using buses and vans. The total estimated annual average daily traffic (AADT) for construction activities driving from SH 55 to the SGLF and between the SGLF and the SGP is listed in Table 2.4-2. Supplies and deliveries for the SGP during
construction would access the SGLF using SH 55 to Warm Lake Road and would use SH 55 through Cascade and other communities along SH 55 south of Cascade including Banks and Horseshoe Bend.

Table 2.4-2 Project Construction and Operations SGP Traffic

<table>
<thead>
<tr>
<th>Phase</th>
<th>Route</th>
<th>Transport Type</th>
<th>AADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>SH 55 to SGLF</td>
<td>HV</td>
<td>30</td>
</tr>
<tr>
<td>Construction</td>
<td>SH 55 to SGLF</td>
<td>LV</td>
<td>169</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>199</strong></td>
</tr>
<tr>
<td>Construction</td>
<td>SGLF to SGP</td>
<td>HV</td>
<td>45</td>
</tr>
<tr>
<td>Construction</td>
<td>SGLF to SGP</td>
<td>LV</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>65</strong></td>
</tr>
<tr>
<td>Operations</td>
<td>SH 55 to SGLF</td>
<td>HV</td>
<td>25</td>
</tr>
<tr>
<td>Operations</td>
<td>SH 55 to SGLF</td>
<td>LV</td>
<td>131</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>156</strong></td>
</tr>
<tr>
<td>Operations</td>
<td>SGLF to SGP</td>
<td>HV</td>
<td>33</td>
</tr>
<tr>
<td>Operations</td>
<td>SGLF to SGP</td>
<td>LV</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>50</strong></td>
</tr>
<tr>
<td>Reclamation and Closure</td>
<td>SH 55 to SGP</td>
<td>HV</td>
<td>15</td>
</tr>
<tr>
<td>Reclamation and Closure</td>
<td>SH 55 to SGP</td>
<td>LV</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

SH 55 to SGLF – State Highway 55 to Stibnite Gold Logistics Facility
SGLF to SGP - Stibnite Gold Logistics Facility to Stibnite Gold Project
HV – heavy vehicle
LV – light vehicle
AADT – annual average daily traffic

The estimated annual average traffic to the SGLF and from the SGLF to the SGP during mining and ore processing operations is also provided in Table 2.4-2. Supplies and deliveries for the SGP during operations would access the SGLF using SH 55 to Warm Lake Road. Approximately two-thirds of all mine-related traffic would originate south of Warm Lake Road and would use SH 55 through Cascade and other communities along SH 55 south of Cascade including Banks and Horseshoe Bend. Approximately one-third of all mine-related traffic originating north of Warm Lake Road would use SH 55 through the communities of Donnelly, Lake Fork, and McCall. Through McCall, mine-related traffic would generally use Deinhard Lane and Boydstun Street. Employees would be encouraged to use company provided shuttle buses as transport to the SGLF from towns along SH 55.

2.4.4.6 Water Use and Water Treatment During Construction

During construction, mine-impacted water would be generated and would require treatment before being discharged to receiving streams. Water treatment plants would be modular, vendor-supplied equipment package skids placed on improved pads with covers and freeze protection for sensitive piping and equipment. Peak capacity on-site for construction water treatment requirements is expected to be 300 gpm with average flows of 18 gpm and 128 gpm during the first and second years of mine site construction, respectively. Water treatment plant residuals would be sent to the TSF for disposal.
2.4.4.7 Transmission Line Upgrades

In order to serve Perpetua’s 60-megawatt (MW) load requirement for the SGP, Idaho Power Company (IPCo) would rebuild or construct 72.8-miles of transmission line and associated facilities (Figure 2.4-6). The existing Cascade to Warm Lake 69-kV transmission line, and much of the Lake Fork to Cascade and the Warm Lake to Yellow Pine 69-kV transmission lines, would be rebuilt to 138-kV clearances and capacity (Perpetua 2021b). A new Johnson Creek Substation would be constructed and a new 9.1-mile, 138-kV transmission line would be built between the new Johnson Creek Substation and the new Stibnite Substation at the SGP. The existing single-phase distribution line between the proposed Johnson Creek Substation and the village of Yellow Pine would remain intact. A new single-phase underground distribution line, within the existing road ROW, would be built along Johnson Creek Road between the Johnson Creek Substation and Wapiti Meadows to the south. The existing 69-kV transmission line between the Cascade Dam and the Cascade Substation would remain unchanged except for tying the two lines into the new Cascade Switching Station. A new 69-kV line would be constructed to connect the Cascade Switching Station to the existing grid to the south.

Changes to the existing IPCo system for SGP operations would include:

- Upgrade approximately 59.1 miles of the existing 12.5-kV and 69-kV transmission lines between the Lake Fork and Johnson Creek substations to 138-kV service. The ROW would be 50 to 100 feet (depending on slope aspect) and existing transmission line support structures would be replaced with taller structures.

- A new approximate 9.1-mile, 138-kV line would be constructed from the Johnson Creek substation to a new substation at the SGP, partially within a former transmission line ROW. The ROW for the new transmission line would be approximately 100 feet wide. At the SGP, transformers would reduce the voltage from 138-kV to 34.9-kV for distribution to facilities through overhead distribution lines or underground conduits.

- Upgrade the substations located at Oxbow Dam, Horse Flat, McCall, Lake Fork, and Warm Lake (Figure 2.4-6).

- A new substation (Johnson Creek substation) approximately 0.7 mile south of the Johnson Creek airstrip on NFS lands would be built to provide low voltage distribution to Yellow Pine and electricity to the SGP (Figure 2.4-6).

- New construction of the Scott Valley and Thunderbolt Tap substations, a new switching substation near Cascade (Cascade switching station), and the removal of the existing Scott Valley substation.
LEGEND

Project Components *
- New Substation **
- Existing Substation **

Transmission Sections
- Cascade Switching to Johnson Creek (Rebuilt)
- Cascade to Cascade Switching (New)
- Johnson Creek to Stibnite (New)
- Lake Fork to Cascade Switching (Rebuilt)
- Johnson Creek to Wapiti Meadows (Underground, New)

Transmission Sections to be Removed

Other Features
- U.S. Forest Service
- Wilderness
- IRA and/or Forest Plan Special Area
- County
- City/Town
- Monumental Summit
- Airport/Landing Strip
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components associated with all alternatives
** Substation locations are approximate

Note: The McCall - Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.

Figure 2.4-6
SGP Transmission Line Overview
Stibnite Gold Project
Stibnite, ID

Surface Management
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- U.S. Forest Service
• Reroute approximately 5.4 miles of transmission line to avoid the Thunder Mountain Estates subdivision. The reroute would parallel Warm Lake Road for approximately 2.4 miles before crossing onto NFS and IDL land for approximately 1.7 miles. The portion crossing IDL property would require a ROW easement. An additional 1 mile of 69-kV transmission line would be required along Thunder City Road linking the existing transmission line out of Emmett to the reroute. Approximately 2.7 miles of transmission line would no longer be required and would be removed.

• Reroute approximately 0.9 miles of transmission line to approximately 600 feet north of its current location between Cascade and Donnelly to use an old railroad grade on private property and the existing transmission line would be removed.

• Install approximately 3 miles of new underground distribution power along Johnson Creek Road from the Johnson Creek substation south to Wapiti Meadows.

The transmission line extends across lands managed by the BNF, PNF, BOR, IDL, and private lands (Figure 2.4-6). Table 2.4-3 summarizes the transmission line segments by land ownership crossed.

Table 2.4-3  Transmission Line Segment Summary by Land Ownership (miles)

<table>
<thead>
<tr>
<th>Line Segment</th>
<th>Total Miles&lt;br&gt;1</th>
<th>BOR Miles</th>
<th>BOR %</th>
<th>Forest Service Miles</th>
<th>Forest Service %</th>
<th>Private Miles</th>
<th>Private %</th>
<th>State or Local Miles</th>
<th>State or Local %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Fork to Cascade Switching Station</td>
<td>20.0</td>
<td>1.2</td>
<td>6.0%</td>
<td>--</td>
<td>--</td>
<td>16.6</td>
<td>83.0%</td>
<td>2.2</td>
<td>11.0%</td>
</tr>
<tr>
<td>Cascade to Cascade Switching Station Tie</td>
<td>0.1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0.1</td>
<td>100.0%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Cascade Switching Station to Johnson Creek</td>
<td>43.6</td>
<td>--</td>
<td>--</td>
<td>31.5</td>
<td>72.2%</td>
<td>6.6</td>
<td>15.1%</td>
<td>5.5</td>
<td>12.6%</td>
</tr>
<tr>
<td>Johnson Creek to Stibnite</td>
<td>9.1</td>
<td>--</td>
<td>--</td>
<td>8.7</td>
<td>95.6%</td>
<td>0.4</td>
<td>4.4%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Transmission Line Total&lt;br&gt;1</td>
<td>72.8</td>
<td>1.2</td>
<td>1.6%</td>
<td>40.2</td>
<td>55.2%</td>
<td>23.7</td>
<td>32.6%</td>
<td>7.7</td>
<td>10.4%</td>
</tr>
<tr>
<td>Johnson Creek to Wapiti Meadows Distribution (underground)</td>
<td>3.1</td>
<td>--</td>
<td>--</td>
<td>2.6</td>
<td>83.9%</td>
<td>0.5</td>
<td>16.1%</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Source: Land ownership derived from parcel data (Valley County 2019a).
<br>1 Totals may not sum correctly due to rounding.
BOR = Bureau of Reclamation
Both temporary and permanent disturbances would be required for the construction of the transmission line and substations. While existing structure locations would be used when possible, the removal and installation of new structures would require temporary disturbance. Where possible, single-pole structures would be installed rather than H-frame structures to minimize the structure disturbance footprint. Table 2.4-4 lists areas permanently disturbed for each transmission line structure type.

**Table 2.4-4  Land Permanently Disturbed for Transmission Line Structures**

<table>
<thead>
<tr>
<th>Structure Type</th>
<th>Area Required Permanently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Pole Tangent Structure</td>
<td>16 square feet, 4-foot by 4-foot base</td>
</tr>
<tr>
<td>Single Pole Guyed Structure</td>
<td>28 square feet, 4-foot by 4-foot base, 3 x multi-helix screw anchors</td>
</tr>
<tr>
<td>H-Frame Tangent Structure</td>
<td>64 square feet, 16-foot by 4-foot base</td>
</tr>
<tr>
<td>H-Frame Guyed Structure</td>
<td>156 square feet, 37-foot by 4-foot base, up to 500 square feet, for up to 10, 5-foot by 10-foot down guy wire plate anchors</td>
</tr>
</tbody>
</table>

Each transmission line structure site needs a construction space large enough to remove the existing structure, excavate structure foundation holes, and install new structure poles and any guys and anchors. Temporary disturbance is based on a 100-foot by 60-foot pad for each structure location. Some temporary disturbance areas would be 100-foot by 100-foot pads. Lands affected during construction by line segment and substations and the land status are listed in Table 2.4-5.

Lands required permanently for Project operations by route segment and land status are listed in Table 2.4-6.

**Table 2.4-5  Land Affected during Construction by Line Segment/Project Component and Land Status (acres)**

<table>
<thead>
<tr>
<th>Line Segment/Project Component</th>
<th>BOR</th>
<th>Forest Service</th>
<th>Private</th>
<th>State or Local</th>
<th>Total ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lake Fork to Cascade Switching Station</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access, Existing (Minor Improvements, 0-50%)</td>
<td>--</td>
<td>--</td>
<td>12.2</td>
<td>1.6</td>
<td>13.8</td>
</tr>
<tr>
<td>Access, Existing (Major Improvements, 50-100%)</td>
<td>--</td>
<td>--</td>
<td>0.9</td>
<td>6.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Access, New (Bladed)</td>
<td>--</td>
<td>--</td>
<td>0.1</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Access, New (Overland Travel)</td>
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<td>--</td>
<td>24.4</td>
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<td>26.7</td>
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<tr>
<td>Access, Temporary (Overland Travel)</td>
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<td>&lt;0.1</td>
<td>--</td>
<td>1.6</td>
</tr>
<tr>
<td>Pulling-Tensioning Sites</td>
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<td>1.0</td>
<td>11.3</td>
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<td>Staging Areas</td>
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<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Structures</td>
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<td>36.2</td>
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<td>&lt;0.1</td>
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<td>1.6</td>
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<tr>
<td>Line Segment/Project Component</td>
<td>BOR</td>
<td>Forest Service</td>
<td>Private</td>
<td>State or Local</td>
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<td>-----</td>
<td>---------------</td>
<td>---------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Lake Forest to Cascade Switching Station – Total¹</td>
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<td>--</td>
<td>82.9</td>
<td>14.7</td>
<td>104.9</td>
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</tbody>
</table>

**Cascade Switching Station to Cascade Substations**

| Access, Existing (Minor Improvements, 0-50%) | -- | -- | -- | -- | -- |
| Access, Existing (Major Improvements, 50-100%) | -- | -- | -- | -- | -- |
| Access, New (Bladed) | -- | -- | -- | -- | -- |
| Access, New (Overland Travel) | -- | -- | 0.1 | -- | 0.1 |
| Pulling-Tensioning Sites | -- | -- | 0.2 | -- | 0.2 |
| Staging Areas | -- | -- | -- | -- | -- |
| Structures | -- | -- | 0.5 | -- | 0.5 |
| Cascade Switching Station to Cascade Substations – Total¹ | -- | -- | 0.8 | -- | 0.8 |

**Cascade Switching Station to Johnson Creek**

<p>| Access, Existing (Minor Improvements, 0-50%) | -- | 55.0 | 2.0 | 0.3 | 57.3 |
| Access, Existing (Major Improvements, 50-100%) | -- | 65.7 | 4.4 | 7.5 | 77.5 |
| Access, New (Bladed) | -- | 2.8 | 0.7 | 1.2 | 4.7 |
| Access, New (Overland Travel) | -- | 0.9 | 7.7 | 1.4 | 10.0 |
| Access, Temporary (Minor Improvements, 0-50%) | -- | -- | 1.6 | 0.2 | 1.7 |
| Access, Temporary (Overland Travel) | -- | -- | 2.0 | -- | 2.0 |
| Pulling-Tensioning Sites | -- | 17.3 | 4.4 | 3.1 | 24.7 |
| Staging Areas | -- | 17.3 | 9.9 | -- | 27.1 |
| Structures | -- | 31.7 | 12.3 | 6.4 | 50.4 |
| Structures, (Remove Existing) | -- | -- | 4.7 | &lt;0.1 | 4.8 |
| Substation, Cascade Switching Station | -- | -- | 2.6 | -- | 2.6 |
| Substation, Johnson Creek | -- | 1.1 | -- | -- | 1.1 |
| Substation (Scott Valley), SGLF | -- | --- | 0.9 | -- | 0.9 |
| Substation, Thunderbolt Drop Substation | -- | 0.1 | -- | -- | 0.1 |
| Substation, Warm Lake | -- | 0.3 | -- | -- | 0.3 |
| Cascade Switching Station to Johnson Creek – Total¹ | -- | 192.2 | 53.2 | 20.1 | 265.2 |</p>
<table>
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<th>Line Segment/Project Component</th>
<th>BOR</th>
<th>Forest Service</th>
<th>Private</th>
<th>State or Local</th>
<th>Total¹</th>
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<tr>
<td><strong>Johnson Creek to Stibnite</strong></td>
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<tr>
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<td>--</td>
<td>1.1</td>
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<td>0.9</td>
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<td>--</td>
<td>--</td>
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Source: Land ownership derived from parcel data (Valley County 2019a).
¹ Totals may not sum correctly due to rounding.
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<tr>
<th>Line Segment/Project Component</th>
<th>BOR</th>
<th>Forest Service</th>
<th>Private</th>
<th>State or Local</th>
<th>Total¹</th>
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<td></td>
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<tr>
<td>Access, Existing (Minor Improvements, 0-50%)</td>
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<td>8.0</td>
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<td>0.1</td>
<td>&lt;0.1</td>
<td>0.1</td>
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<td>--</td>
<td>29.1</td>
<td>5.4</td>
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<tr>
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<td>--</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Lake Forest to Cascade – Total¹</td>
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<td>0.1</td>
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</tr>
<tr>
<td><strong>Cascade Switching Station to Johnson Creek</strong></td>
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<td></td>
</tr>
<tr>
<td>Access, Existing (Minor Improvements, 0-50%)</td>
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<td>32.1</td>
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<td>0.2</td>
<td>33.4</td>
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<td>Access, Existing (Major Improvements, 50-100%)</td>
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<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
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<td>2.6</td>
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<tr>
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<td>0.4</td>
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<tr>
<td>Substation (Scott Valley), SGLF</td>
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<td>--</td>
<td>0.9</td>
</tr>
<tr>
<td>Substations, Thunderbolt Drop Substation</td>
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<td>--</td>
<td>--</td>
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<tr>
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<td>--</td>
<td>--</td>
<td>0.3</td>
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<td>65.5</td>
<td>13.8</td>
<td>5.4</td>
<td>84.5</td>
</tr>
</tbody>
</table>
The transmission line structures would use standardized IPCo structure types, including single-pole and H-frame structures in a variety of configurations. Distribution underbuild is a construction method where the distribution voltage circuit is constructed underneath the transmission circuit to reduce the number of power poles. Single-pole structures would be used in areas where distribution underbuild is present, shorter structure spans are needed, smaller corridors are used, or a limited structural footprint is required. Typical spans for single-pole structures would be approximately 300 feet in length. H-frame structures typically comprise two poles and would be used for areas where longer spans, increased structural capacity, or mountainous terrain is encountered. Typical spans for H-frame structures would be approximately 600 feet in length. Structure heights would vary between 45 and 80 feet depending upon
structure type and terrain. However, structure heights greater than 80 feet could be required in isolated instances.

The estimated number of each type of structure by line segment is available in the Plan of Development (POD) for Electrical Transmission, Stibnite Gold Project (Perpetua 2021b).

**Foundations**

Structure foundations would include direct embedded wood poles. Angle structures and dead-end structures could require the excavation and placement of guy anchors to complete the structure installation, if needed. In locations where guy anchors would not be feasible and designed steel poles would be necessary, structures would be supported by drilled pier caisson foundations.

**Conductors**

Electrical transmission and distribution lines use metallic conductors to allow the flow of current which are designed in a manner that balances current flow, strength, and sagging characteristics. Alternating current (AC) transmission lines use three phases for each transmission circuit. IPCo standards require a minimum ground clearance of 24.5 feet for all new construction of 138-kV transmission lines. Additionally, the transmission lines would include fiber-optic cables and 3/8-inch steel overhead ground wire.

**Overhead Ground Wire and Electrodes**

Overhead ground wires are required to provide a transmission system with protection from the adverse effects of lightning. The shielding of the transmission system would be provided by an optical ground wire, which is a steel-coated, fiber-optic cable that provides the same levels of system protection as steel overhead ground wire, but also includes a core of fiber-optic cables used for communications.

**Distribution Underbuild**

Distribution underbuild (the lower voltage line) would be co-located on the transmission line structures under the primary 138-kV voltage (the higher voltage line).

Distribution underbuild is usually the last remaining conductor to be installed after the transmission conductors, overhead ground wire, and optical ground wire are finished.

**Grounding**

Grounding a transmission line is required to operate and maintain the facility safely. The grounding process is achieved by electrically connecting structure hardware to a ground rod buried within the earth. This electrical connection of hardware allows the safe flow of current and does not allow the build-up of voltage that could cause a mechanical failure or safety concern.

An electrical effects study is required to determine the methods and equipment needed to safely mitigate the site-specific current flows through these adjacent facilities. Typically, all metallic structures within the ROW would be grounded, including buildings, fences, and pipelines. If the electrical effects study determines that structures outside of the ROW require grounding, mitigation measures to safely ground those facilities would be required.
Other Nonelectrical Hardware

For utilities where avian protection and aircraft warnings are required, non-electrical hardware may be installed on the line. This hardware or marking could include bird flight diverters, marker balls, tower lighting, or tower painting. Structures would be marked or protected from avian intersect using the guidelines and methodologies detailed in the Avian Power Line Interaction Committee (APLIC) recommendations. Any Federal Aviation Administration (FAA) requirements would be in accordance with the FAA Circular 70/7460 document, which details the operational requirements for structures exceeding a safe operational elevation in relation to air space.

Access Roads

In addition to the transmission line work detailed above, the existing road network used to access these structures may require maintenance/improvements to allow construction equipment safe access into the power line corridor. While the existing road network proximate to the transmission line ROW would be used to the maximum extent possible, some new service roads (roads used solely by Perpetua or IPCo to access Project facilities) could be needed to reach structure locations without existing access.

Additionally, overland service routes would be required from the existing access road to reach structure locations without current access. These overland service routes would not require blade work (i.e., recontouring). A 14-foot-wide ROW is being requested for the existing/proposed roads outside of the power line corridor ROW to accommodate construction and maintenance equipment. For FR 467, a 16-foot-wide ROW is being requested to accommodate OSV.

During construction, the new section of transmission line between the Johnson Creek substation and the SGP would require major improvements to Horse Heaven Road (FR 416W), NFS Trail 233 (no name), and approximately 4 miles of new spur roads would be constructed. Minor upgrades to Cabin Creek Road (FR 50467) would also be required.

Road maintenance requirements prior to construction would vary depending on the type of road, level of use, and condition of the road. However, maintenance generally would consist of clearing vegetation and rocks, as well as repairing cut and fill slope failures, as necessary, to allow for a 14-foot-wide road surface. In most cases, the roads would be left as close to an undeveloped nature (i.e., two-track road) as possible without creating environmental degradation (e.g., erosion or rutting from poor water drainage). Equipment to perform the required road maintenance would include hand tools (e.g., chainsaws), track driven machines (bulldozers and graders) and crew-haul vehicles (such as 4-wheel-drive pickups and/or off-highway vehicles [OHV; includes all terrain vehicles (ATVs), utility task vehicles (UTVs) and side-by-sides]). Roads would be opened/cleared for use by trucks transporting materials, excavators, drill rigs, bucket trucks, pickup trucks, and crew-haul vehicles. Specific actions, such as installing water bars and dips to control erosion and stormwater, would be implemented to reduce construction impacts and would follow standard designs.

Access road construction and disturbance can typically be summarized into five types of access roads:
**Existing (No Improvement)** – These existing roads provide access to structures and would not require improvement. Minor maintenance activities such as pruning of vegetation for construction vehicle access and applying water to the road to reduce dust may be required.

**Existing (Minor Improvement)** – These existing roads provide access to structures and should not require significant improvement to utilize for construction. Existing road widths typically vary from 14-foot-wide access roads to 24-foot-wide gravel roads with 14 feet being the minimum needed to accommodate construction traffic. Minor maintenance activities such as applying water to the road to reduce dust and improve workability of the soil for blading and compaction, and blading may be required during and after construction to support construction traffic and return the road to a preconstruction condition.

**Existing (Major Improvement)** – These existing roads provide access to the structures and may require major reconstruction work. These roads appear to be in questionable condition and would likely require major reconstruction to support construction traffic. Existing road widths may be as narrow as 8 feet for primitive two-track roads that need reconstruction to widen the driving surface to 14 feet, with curve widening and turnouts added to accommodate construction traffic. Overall disturbance width is estimated to be an average of 20 feet, which includes cut/fill slopes and other impacts associated with reconstruction. Maintenance activities such as applying water to the road, to reduce dust and improve workability of the soil, and blading may be required during and after construction to support construction traffic. Aggregate/crushed rock placement may be required to maintain the existing road.

**New (Overland Travel)** – These roads traverse existing agricultural fields or open areas and are not expected to require grading work to support construction traffic. No permanent road construction is anticipated on these routes, and any earthwork or aggregate imported would be reclaimed after construction. Temporary driving surface is estimated to be 14 feet to accommodate construction traffic. Sections of road that cross wet fields or wetlands may have temporary matting installed to provide a stable surface to support construction equipment without disturbing the ground. Minor work such as grade smoothing at ditches or large rock removal may be required to provide a drivable surface.

**New (Bladed)** – New bladed roads are typically required where the existing ground has a significant cross slope or traverses terrain that needs to be bladed smooth. Construction of the road prism would require excavation and placement of fill material to provide a stable driving surface. The driving surface is constructed to a minimum width of 14 feet and includes curve widening and turnouts to accommodate construction traffic. Overall disturbance width is estimated to be an average of 35 feet, which includes cut/fill slopes and other impacts associated with construction. Earthwork quantities are typically balanced for each road by adjusting the grade to balance material being cut versus filled. Surfacing rock is not typically placed on these roads unless required by stakeholders or needed to support construction traffic.

Table 2.4-7 provides a summary of miles of access roads by route segment and land status.
### Table 2.4-7 Miles of Access Roads by Line Segment and Land Ownership

<table>
<thead>
<tr>
<th>Line Segment/ Access Type</th>
<th>BOR</th>
<th>Forest Service</th>
<th>Private</th>
<th>State or Local</th>
<th>Total¹</th>
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<td><strong>Lake Fork to Cascade Switching Station</strong></td>
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<td></td>
<td></td>
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<td><strong>Cascade to Cascade Switching Station Tie</strong></td>
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<td></td>
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<tr>
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<td>--</td>
<td>--</td>
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<td>Access, New (Bladed)</td>
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</tr>
<tr>
<td>Access, New (Overland Travel)</td>
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<td>&lt;0.1</td>
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<td><strong>Cascade Switching Station to Johnson Creek</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access, Existing (No Improvements)</td>
<td>--</td>
<td>5.1</td>
<td>4.2</td>
<td>4.6</td>
<td>13.9</td>
</tr>
<tr>
<td>Access, Existing (Minor Improvements, 0-50%)</td>
<td>--</td>
<td>18.9</td>
<td>0.7</td>
<td>0.1</td>
<td>19.7</td>
</tr>
<tr>
<td>Access, Existing (Major Improvements, 50-100%)</td>
<td>--</td>
<td>17.8</td>
<td>1.1</td>
<td>2.0</td>
<td>20.9</td>
</tr>
<tr>
<td>Access, New (Bladed)</td>
<td>--</td>
<td>0.6</td>
<td>0.1</td>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Access, New (Overland Travel)</td>
<td>--</td>
<td>0.4</td>
<td>4.0</td>
<td>0.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Access, Temporary (Minor Improvements, 0-50%)</td>
<td>--</td>
<td>--</td>
<td>0.5</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Access, Temporary (Overland Travel)</td>
<td>--</td>
<td>--</td>
<td>1.0</td>
<td>--</td>
<td>1.0</td>
</tr>
<tr>
<td>Cascade Switching Station to Johnson Creek – Total¹</td>
<td>--</td>
<td>42.8</td>
<td>11.6</td>
<td>7.7</td>
<td>62.1</td>
</tr>
<tr>
<td>Line Segment/ Access Type</td>
<td>BOR</td>
<td>Forest Service</td>
<td>Private</td>
<td>State or Local</td>
<td>Total¹</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----</td>
<td>----------------</td>
<td>---------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Johnson Creek to Stibnite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access, Existing (No Improvements)</td>
<td>--</td>
<td>&lt;0.1</td>
<td>0.7</td>
<td>--</td>
<td>0.7</td>
</tr>
<tr>
<td>Access, Existing (Minor Improvements, 0-50%)</td>
<td>--</td>
<td>3.7</td>
<td>0.4</td>
<td>--</td>
<td>4.1</td>
</tr>
<tr>
<td>Access, Existing (Major Improvements, 50-100%)</td>
<td>--</td>
<td>10.1</td>
<td>0.3</td>
<td>--</td>
<td>10.3</td>
</tr>
<tr>
<td>Access, New (Bladed)</td>
<td>--</td>
<td>3.5</td>
<td>0.1</td>
<td>--</td>
<td>3.7</td>
</tr>
<tr>
<td>Access, New (Overland Travel)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Johnson Creek to Stibnite – Total¹</td>
<td>--</td>
<td>17.3</td>
<td>1.5</td>
<td>--</td>
<td>18.9</td>
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<tr>
<td><strong>Total for all Line Segments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>--</td>
<td>5.1</td>
<td>5.2</td>
<td>4.6</td>
<td>14.9</td>
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<td>Access, Existing (Minor Improvements, 0-50%)</td>
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<td>22.6</td>
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<td>28.5</td>
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<tr>
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<td>--</td>
<td>27.9</td>
<td>1.7</td>
<td>3.8</td>
<td>33.3</td>
</tr>
<tr>
<td>Access, New (Bladed)</td>
<td>--</td>
<td>4.1</td>
<td>0.3</td>
<td>0.4</td>
<td>4.8</td>
</tr>
<tr>
<td>Access, New (Overland Travel)</td>
<td>0.6</td>
<td>0.4</td>
<td>16.6</td>
<td>1.3</td>
<td>18.9</td>
</tr>
<tr>
<td>Access, Temporary (Minor Improvements, 0-50%)</td>
<td>--</td>
<td>--</td>
<td>0.5</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Access, Temporary (Overland Travel)</td>
<td>0.8</td>
<td>--</td>
<td>1.0</td>
<td>--</td>
<td>1.8</td>
</tr>
<tr>
<td>Proposed Line Segment – Total¹</td>
<td>1.4</td>
<td>60.2</td>
<td>30.5</td>
<td>10.7</td>
<td>102.8</td>
</tr>
</tbody>
</table>

Source: Land ownership derived from parcel data (Valley County 2019a).
¹ Totals may not sum correctly due to rounding.

### Substations

IPCo determined there would be a need to increase the 230/138-kV transformer capacities at the Oxbow and Horse Flat substations to support the SGP load. A 20 megavolt amps reactive capacitor bank would also need to be installed at the McCall Substation for voltage support under abnormal (element out of service) conditions. A new 138/69-kV switching substation would be required to be located near Cascade. Several smaller substations along the transmission line from Cascade to Yellow Pine would also need to be upgraded from 69-kV to 138-kV. A 138-kV metering substation would be placed in the Johnson Creek area to feed the village of Yellow Pine and serve as a metering point for the Stibnite 138-kV line. The substations would be operated and maintained by IPCo. Table 2.4-6 provides the area that is needed, by land status, for each of the substations.

Additional details regarding the upgrades needed to existing substations and the construction of new substations are available in the Electrical Transmission POD (Perpetua 2021b).
Periodic inspections of the transmission lines and supporting structures would be required and conducted as described below. Depending on the results of the inspection, maintenance work may be scheduled for immediate follow up (e.g., in the case of imminent failure or safety issues) or follow up in subsequent year(s) (e.g., issues that need to be repaired but do not cause an imminent problem). The activities presented below are considered routine Operation and Maintenance activities. Subject to specific terms, conditions, and stipulations of the ROW grant and reporting requirements contained herein, these activities may be conducted by IPCo as necessary and without prior notification to the Forest Service:

- Routine air patrols to inspect for structural and conductor defects, conductor clearance problems, and hazardous trees. These are typically conducted from a helicopter, and personnel include a pilot and line patrolmen.

- Routine ground patrols to inspect structural and conductor components. A vast majority of such inspections would require either a pickup truck or OHV. Patrols may rely on direct line of-sight and/or binoculars. Patrols are typically conducted in the spring and fall.

- Climbing surveys to inspect hardware or make repairs. Personnel access these structures by pickup, OHV, or on foot.

- Line and structure inspections may also be conducted using unmanned aerial vehicles.

- Structure or conductor maintenance from a bucket truck. Routine cyclical vegetation clearing to trim or remove tall shrubs and trees to prevent encroachment into the minimum vegetation clearance distance consistent with IPCo standards.

- During all vegetation clearing activities, IPCo would ensure there is no disturbance of the soil surface that would create an added risk of erosion, the promotion of the establishment or expansion of invasive species (including noxious weeds), damage to cultural resources, sensitive species, or ESA listed species.

- Removal of hazard trees within, or adjacent to, the ROW that pose a risk of falling into conductors or structures and causing outages or fires. Wood pole inspection and treatment to retard rotting and structural degradation.

- Routine inspection and maintenance of authorized service and access roads (length and width and alignment of road remains the same), such as blading the road to maintain the surface condition and drainage, removing minor physical barriers (i.e., rocks and debris), replacing culverts or rock crossing, and rehabilitating after major disturbances requiring heavy equipment (such as slumping). Heavy equipment would travel and maneuver on existing service and access roads.

- Vegetation removal on service roads to allow the necessary clearance for access and provide for worker safety. Removal is conducted by hand crews using chain saws or by mechanical means. Plants that would not interfere with the safe operation of vehicles and equipment would be left in place.
• Installation of bird protection devices, bird perch discouragers, and relocation or removal of bird nests. Under the authority of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, or Idaho Code, the appropriate permits would be acquired from the U.S. Fish and Wildlife Service (USFWS) and/or Idaho Department of Fish and Game (IDFG), prior to relocation or removal of nests.

• Reduction of fuel loads around wood poles in fire-prone areas by (1) removal of vegetation within a 20-foot radius and/or treatment with herbicide from the approved Forest Service list by a certified applicator, and in accordance with the Pesticide Use Permit, or (2) application of fire-retardant coating to the base of wood poles. If herbicide is used, IPCo would report to the Forest Service the amount used for Forest Service’s herbicide application yearly report.

• In-kind structure replacement (such as replacing a cross-arm, replacing an insulator, replacing a single wood pole with a single wood or steel pole). A bucket truck and/or other rubber-tired vehicles may be located on or off a road.

• Non-cyclical vegetation clearing to remove saplings or larger trees in the ROW consistent with IPCo standards.

• Structure or conductor maintenance in which earth must be moved, such as for the creation of a landing pad for construction or maintenance equipment.

• Follow-up restoration activities, such as seeding, noxious-weed control, and erosion control. To minimize the potential for wildland fires to damage structures, reseeding activities would not occur within a 20-foot radius around structures.

• Conductor replacement, which requires the use of several types of trucks and equipment and grading to create a safe work area to hang and pull the conductor into place.

Substation maintenance activities would include equipment testing, preventative repair, and procedures for providing continual service and maintaining electrical service. Typical substation maintenance does not require ground-disturbing activity, although ground disturbance could be required to replace damaged equipment, oil containment facilities, or other miscellaneous items.

2.4.4.8 Communication Towers and Repeater Sites

Perpetua installed a microwave relay communications tower in 2013, on private land to the east of the SGP, for communications. The existing communications tower would be upgraded by anchoring the existing tower pad; extending the tower 20 feet in height; upgrading the antenna by adding a dish or second antenna; and installing new high frequency radios capable of increasing bandwidth to 1,000 megabits per second. Alternatively, Perpetua in partnership with IPCo and local communication providers could add fiber optic cable to the transmission line between Cascade and Stibnite. The existing microwave relay tower is shown on Figure 2.4-2.
The existing two-way radio system would need to be expanded at the SGP and along the Burntlog Route to allow rapid communication between equipment operators and ground personnel, and to allow broadcast of emergency messages. The two-way radio system would be supported by a series of repeaters placed on public and private land.

A series of VHF radio repeaters would be placed along the Burntlog Route as needed. The VHF repeaters would be placed near the existing Meadow Creek Lookout and Thunderbolt Lookout communication sites, the new Burntlog Maintenance Facility, and on private parcels at the SGP, as needed. The 10-foot-tall towers on 3-foot by 3-foot concrete pads would be supported by solar panels, support hardware, and a backup battery case. Given their location at existing or proposed facilities, no additional disturbance for equipment installation or access would be required for their construction or maintenance. Each site would be accessed annually (at a minimum) or as required for maintenance. No additional disturbance for equipment installation or access would be required.

A cell tower also would be installed to facilitate area communications. The proposed cell tower would be approximately 60 feet tall and would include surface disturbance of approximately 30 feet by 60 feet (0.04 acre) and utilizing an existing access road. The cell tower location would be near the proposed transmission line alignment upslope of the Hangar Flats pit (Figure 2.4-2).

### 2.4.4.9 Off-site Facilities

Perpetua would require off-site facilities to support mine-related activities. Administrative offices, a transportation hub, and warehousing and assay laboratory would be located at the proposed SGLF, while road maintenance and snow removal activities would be supported by Perpetua from the proposed Burntlog Maintenance Facility.

Additional off-site facilities that would be constructed and operated are described below.

**Stibnite Gold Logistics Facility**

The SGLF would be located along Warm Lake Road on private land (approximately 7 miles northeast of Cascade), with access to SH 55 (Figure 2.4-1). The SGLF would require approximately 25 acres of disturbance to accommodate employee parking, an assay laboratory building, a core sampling logging storage facility, warehouses, laydown yards, equipment inspection areas, a truck scale, and an administration building for Perpetua personnel (Figure 2.4-7). The facility would be surrounded by a security fence. One point of ingress/egress would access office parking and the mine personnel card-entry gate, while another ingress/egress would access the truck yard via a guard shack. The parking and assembly area would accommodate approximately 250 light vehicles for employees using bus or van pooling to the SGP. Perpetua would mandate the use of busing and vans for employee and contractor transportation to the SGP.
Figure 2.4-7
Stibnite Gold Logistics Facility

Stibnite Gold Project
Stibnite, ID

Data Sources: Perpetua 2021a

(See Figure 2.4-1 for location of Stibnite Gold Logistics Facility.)
Perpetua would require supply truck drivers to check in at the SGLF and direct them to either proceed to the SGP or unload at the warehouse for temporary storage and consolidation of their load. A truck scale would be located at the SGLF to verify loads going into or out of the warehouse area. The check-in process would include general safety and road readiness inspection of incoming trucks and equipment being transported to SGP. Heavy equipment transport vehicles would be inspected for items such as presence of weeds, excessive soil on earth moving equipment, safety equipment, installed and maintained engine brake muffling systems, and general safety checks of equipment.

In addition, the Scott Valley substation would be located within the property boundary north of the SGLF, surrounded by a separate security fence.

The SGLF would require a domestic groundwater well to service the facility. This well and associated water right would require permitting through the Idaho Department of Water Resources (IDWR).

**Burntlog Maintenance Facility**

The Burntlog Maintenance Facility would be located on NFS land within a previously disturbed borrow source site 4.4 miles east of the junction of Johnson Creek Road and Warm Lake Road (Figure 2.4-1) and would be accessed via the Burntlog Route with two points of ingress/egress. The facility footprint would be approximately 3.5 acres and would not be fenced. The facility would include three main buildings: a 7,000-square-foot maintenance building; a 7,000-square-foot aggregates storage building; and a 4,050-square-foot equipment shelter (Figure 2.4-8). It would also contain a fuel station, electric generator, propane tank, outdoor storage area, and worker sleeping quarters. It would house sanding/snowplowing trucks, snow blowers, road graders, and support equipment in the equipment shelter or maintenance buildings. The Burntlog Maintenance Facility would require a domestic groundwater well to service the facility. This well and associated water right would require permitting through the IDWR.

This facility would include a double-contained fuel storage area housing three above-ground 2,500-gallon fuel tanks for on-road diesel, off-road diesel, and unleaded gasoline. Additionally, a 1,000-gallon used oil tank would be located inside the maintenance facility and a 1,000-gallon propane tank would be located at the facility for heating.

Additional features of this facility could include covered stockpiles of coarse sand and gravel for winter sanding activities; temporary or emergency on-site housing for road maintenance crews during periods of heavy snow removal needs and other winter maintenance activities; and communications equipment including a tower. This facility could also serve to support snowmobile trail grooming and grooming equipment storage as needed.

**2.4.5 Mine Operations**

The SGP would consist of mining three primary mineral deposits and the re-mining of historical tailings using conventional open pit shovel and truck mining methods. Ore from three open pits (Yellow Pine, Hangar Flats, and West End pits) would be sent to either the crusher, located near the processing plant, or one of several ore stockpiles in various locations within the Operations Area Boundary (Figure 2.4-2; M3 2021). Pre-stripping, or removing the overlying soil and rock (i.e., development rock) to access the mineral deposit, would commence during the construction phase in Mine Year -2. Ore removal and
processing would begin in Mine Year 1 (operations phase) and continue year-round for approximately 15 years. Mine operations would occur in the area of two historical open pit mined areas (Yellow Pine and West End) and one new open pit (Hangar Flats) that includes former underground mining and mineral processing facilities.

In general, ore mined from the three open pits would be hauled directly to the primary crusher area; however, during extended periods when the ore tonnage or ore type from the pits exceed the availability of the ore processing plant, the ore would be stockpiled and processed at a future time. Development rock (also commonly referred to as waste rock) would be hauled to the TSF embankment or placed in one of four destinations: the TSF Buttress or the Yellow Pine, Hangar Flats, and West End open pits once they are mined out.

2.4.5.1 Open Pits

Figure 2.4-2 shows the location and extent of the three pits to be mined. A general sequence for mining, assuming 15 years of mine operations as shown on Figure 2.4-3, would be as follows:

- Yellow Pine pit – Mine Years 1 through 7
- Hangar Flats pit – Mine Years 4 through 7
- West End pit – Mine Years 7 through 12
- Stockpile mining – Mine Years 12 through 15

The Yellow Pine pit would be in the northern portion of the SGP, in the same general location as a historical open pit mining area. The pit would be expanded to include a shallower mining area to the northeast previously mined as the Homestake pit. The East Fork SFSR currently flows through the legacy Yellow Pine pit, forming a small pit lake (Yellow Pine pit lake), when the East Fork SFSR flowed into the pit after it was abandoned in the 1950s.

The West End pit would be in the northeast portion of the SGP, east of and at a higher elevation than the Yellow Pine pit, generally situated between Sugar Creek to the north and Midnight Creek to the south. The West End pit would be in the same general location as historical open pit mining where multiple open pits, mine benches, waste rock dumps, and areas of deep backfill exist. The existing Stibnite pit is within the southern portion of the West End pit, and once expanded would be known as the Midnight pit.

The Hangar Flats pit would be in the central portion of the SGP, generally encompassing steep south and southeast facing slopes and the adjacent Meadow Creek valley floor at the toe of these slopes. Historical mining activity in this area was primarily underground but the proposed pit also would encompass the site of the former Bradley mill and smelter, the Hecla heap leach, and Stibnite Mine Inc. leach pads.
(See Figure 2.4-1 for the Burntlog Maintenance Facility location.)

Figure 2.4-8
Burntlog Maintenance Facility
Stibnite Gold Project
Stibnite, ID
Data Sources: Perpetua 2021a
Table 2.4-8 provides a summary of characteristics for each pit.

### Table 2.4-8  Summary of Characteristics for Mine Pits

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Yellow Pine Pit</th>
<th>West End Pit</th>
<th>Hangar Flats Pit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acreage</td>
<td>222</td>
<td>185</td>
<td>66</td>
</tr>
<tr>
<td>Bottom Elevation (feet amsl)</td>
<td>5,360</td>
<td>6,180</td>
<td>6,080</td>
</tr>
<tr>
<td>Depth (feet) below existing ground surface</td>
<td>720</td>
<td>440</td>
<td>460</td>
</tr>
<tr>
<td>Highwall Height Above Valley Bottom (feet)</td>
<td>600 for western highwall, 900 for eastern highwall</td>
<td>1,000 highwalls</td>
<td>800 for northwestern highwall</td>
</tr>
<tr>
<td>Approximate Total Tonnage Mined (in million tons)</td>
<td>163</td>
<td>198</td>
<td>31</td>
</tr>
<tr>
<td>Approximate Ore/Development Rock Tonnage Mined (in million tons)</td>
<td>53 / 110</td>
<td>50 / 148</td>
<td>9 / 22</td>
</tr>
<tr>
<td>Disposal of Development Rock</td>
<td>TSF embankment, TSF Buttress, Yellow Pine backfill</td>
<td>Yellow Pine backfill, TSF Buttress, Hangar Flats backfill, TSF embankment, Midnight backfill</td>
<td>TSF embankment, TSF Buttress, Yellow Pine backfill</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a

amsl = above mean sea level.

Partial dewatering of the open pits would occur prior to and concurrent to renewed SGP mining. Shallow alluvial and deeper bedrock wells would be drilled adjacent to the pits to intercept and pump groundwater before it flows into the pits. During mine operations, groundwater seepage and in-pit surface water runoff would be collected for reuse in the ore processing plant or treated and discharged, according to whether there was a water deficit or surplus at a given time. Additional details on pit water management can be found in Section 2.4.5.10.

### 2.4.5.2 Drilling and Blasting

Drilling and blasting would be used to break ore and development rock in the mine pits (see M3 2021 for additional details). Following drilling, explosives would be used to break rock into fragments that are suitable for loading into equipment. An Explosives and Blasting Management Plan would be prepared as part of the final mine plan. Explosives storage, transport, handling, and use would comply with applicable Department of Homeland Security, Bureau of Alcohol, Tobacco, Firearms and Explosives, Department of Transportation, and Mine Safety and Health Administration (MSHA) regulations.
2.4.5.3 Rock Loading and Haulage

Rock loading and haulage would use a development fleet and a production mining fleet. Mine development excavation required to establish haul truck access roads, access limestone, and pre-stripe pits prior to production mining would use a fleet of medium sized excavators, wheel loaders, and 45-ton articulated trucks. This development fleet would also be used to salvage growth media and support reclamation activities. Production mining would use a conventional diesel truck and shovel fleet consisting of two 28-cubic yard hydraulic shovels, approximately sixteen 150-ton haul trucks, and one 28-cubic yard wheel loader. The wheel loader would be used primarily to load haul trucks during shovel maintenance and to load stockpiled ore as needed. The ore would be hauled directly to the primary crusher or the run-of-mine ore stockpile at the ore processing facilities.

2.4.5.4 Ore Management

Ore from the open pits would be hauled to and placed directly into the ore processing plant, except during periods when the amount or type exceeds the availability of the ore processing plant, the excess ore would be stockpiled in unlined facilities on top or within other mine disturbance areas. Seven long-term ore stockpiles and one short-term stockpile would be used to manage the excess ore (Figure 2.4-2). The long-term ore stockpiles would be located on and near the TSF Buttress and Hangar Flats pit and the short-term stockpiles would be located near the crusher.

Highest-grade ore would be sent directly to the crusher, or to the short-term stockpile area near the crusher where it would likely be processed within a few days. Lower-grade ore would be sent to the long-term ore stockpiles where it would remain for months or longer. Some of the ore sent to the low-grade ore stockpiles would be re-handled during active mine operations, and some would be re-handled and processed once open pit mining has ceased. If metal prices do not support processing of some of the long-term stockpiles, the stockpiled material would be covered as part of TSF Buttress closure activities (Section 2.4.7).

Three long-term ore stockpiles would be on the TSF Buttress on the north side of the valley. Two stockpiles would be adjacent to the Hangar Flats pit and extended onto the pit footprint after it is backfilled. A stockpile within the West End pit footprint would temporarily store ore mined during West End Road development and pre-stripping. Ore storage in long-term stockpiles peaks in Year 11 with approximately 19 million tons.

2.4.5.5 Development Rock Production and Storage

Development rock from the three open pits would be sent to five different permanent destinations over the mine life including the TSF embankment and rind fills; the TSF Buttress; the mined-out Yellow Pine open pit; the mined-out Hangar Flats open pit; and the Midnight area within the mined-out West End open pit. In addition to these five areas, other destinations would receive development rock from the three open pits including a temporary ore stockpile base within the West End open pit, a foundation for stockpiling growth medium and recovered seed bank material, a reclamation materials stockpile located on the TSF Buttress, and miscellaneous projects such as road fills and ore stockpile foundations. The development rock production rate would vary throughout the life of the mine because the cut-off grades demarcating ores from development rock would vary due to fluctuating economic conditions. At
individual open pits, the determination between ore and development rock is initially based on the mine 
plan and the delineation of the ore and development rock as determined through production mapping and 
analysis of blast hole cuttings in the grade control program. Approximately 280 million tons of 
development rock from active mining areas would be used to construct the TSF embankment and buttress, 
and placed in the mined-out pits, as described in Table 2.4-9.

After the main portion of the Yellow Pine pit has been mined and mining commences in the northern 
portion of the pit, development rock would be end-dumped into the Yellow Pine pit as backfill. The 
dumped development rock would not be mechanically compacted, except as it nears the final reclaimed 
surface elevation of the backfilled area.

The upper lifts of the backfill would be placed by direct dumping and compaction. The final backfill 
would be covered with a geosynthetic liner and soil/rock cover, and the East Fork SFSR and Stibnite 
Lake would be established across the backfill in a geosynthetic-lined stream/floodplain corridor. The 
inclusion of the lined Stibnite Lake on the Yellow Pine pit backfill would help buffer temperature 
extremes in the East Fork SFSR and replace the fish habitat of the existing Yellow Pine pit lake. The 16-
million-gallon lake feature was designed based on results of lake temperature modeling to reduce diurnal 
temperature fluctuations while increasing average temperatures in effluent stream flow (see also Sections 
4.9.2.2 and 4.9.2.4, Brown and Caldwell 2021i, Rio ASE 2021). Development rock to backfill the Yellow 
Pine pit would be sourced predominantly from the West End pit, with minor quantities originating from 
the Yellow Pine and Hangar Flats pits.

Once mining ceases at the Hangar Flats pit, development rock to backfill the Hangar Flats pit would be 
sourced predominantly from the West End pit. The Midnight pit, a portion of the West End pit in the 
southeast corner of the pit near Midnight Creek, would be backfilled concurrent to mining the West End 
pit, with development rock from the West End pit once mining in the area to be backfilled is completed.

In addition to the permanent development rock storage described above, a temporary DRSF would be 
constructed within the West End pit during road construction and pre-stripping activities. This temporary 
DRSF would contain approximately 2.5 million tons and serve as the base for the West End In-Pit 
stockpile. The purpose of this DRSF is to reduce the need for mixing the smaller development haul truck 
traffic with production haul truck traffic for safety purposes, and to provide a base for stockpiling ore 
encountered during road development and pre-stripping within the West End pit. Since this is a temporary 
DRSF entirely within the footprint of the West End pit, it would be rehandled during regular mine 
operations at the West End pit and relocated to other facilities for permanent development rock storage.

Perpetua has conducted geotechnical investigations supporting the design of the development rock 
backfills.

Surface water and groundwater management for facilities that permanently store development rock are 
discussed in Section 2.4.5.10, Surface Water and Groundwater Management. A Development Rock 
Management Plan, which describes procedures and methods for active management of development rock 
that is produced and stored across the SGP during operations, has been provided (Brown and Caldwell 
2021d).
Table 2.4-9  Development Rock Management Summary

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>TSF Buttress(^1)</th>
<th>Hangar Flats Backfill(^1)</th>
<th>Midnight Backfill</th>
<th>Yellow Pine Backfill</th>
<th>TSF Embankment(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Meadow Creek valley southwest of Hangar Flats pit</td>
<td>Backfill into Hangar Flats pit</td>
<td>Backfill into south portion of West End pit</td>
<td>Backfill into the Yellow Pine pit</td>
<td>In the Meadow Creek drainage west of the Hangar Flats</td>
</tr>
<tr>
<td>Source</td>
<td>Hangar Flats pit, Yellow Pine pit, and West End pit</td>
<td>Yellow Pine pit and West End pit</td>
<td>West End pit</td>
<td>West End pit, Yellow Pine pit, and Hangar Flats pit</td>
<td>Hangar Flats pit, Yellow Pine pit, West End pit, historical SODA, and Hecla heap leach legacy materials</td>
</tr>
<tr>
<td>Million Tons(^2)</td>
<td>81</td>
<td>18</td>
<td>7</td>
<td>113</td>
<td>61</td>
</tr>
<tr>
<td>Acres</td>
<td>120</td>
<td>41</td>
<td>18</td>
<td>180</td>
<td>88</td>
</tr>
<tr>
<td>Height (feet)</td>
<td>460</td>
<td>460</td>
<td>320</td>
<td>740</td>
<td>245 Initial embankment: 245 Final embankment: 460</td>
</tr>
</tbody>
</table>
| Steepest Surface Grade (Horizontal: Vertical)\(\) | Overall 3:1                                                                    | Varies from 5:1 to 2.5:1       | 3:1 north (pit) side 2:1 south side matching undisturbed slope | Varies from 5:1 to approximately 2.5:1                  | 2:1 inter-bench (upstream)
2:1 overall (downstream) TSF slopes would meet IDWR and engineering standards, reviewed by IDWR in order to obtain Approval for Construction |

Source: Perpetua 2021a

\(^1\)The TSF Buttress was formerly referred to as the Hangar Flats Development Rock Storage Facility. To be consistent with the naming convention used for the other backfilled pits, the 2021 MMP uses the term Hangar Flats pit backfill for the backfilled Hangar Flats pit.

\(^2\)Limited amounts of development rock would be used to construct haul roads and pad areas for site facilities. In addition, some development rock may be crushed and screened for use as road surfacing material and/or concrete aggregate. The Development Rock Management Plan (Perpetua 2021c) specifies testing to determine which development rock can be used for these applications.

\(^3\)The source of development rock for TSF construction includes material from the SODA and the Hecla heap leach facility.
2.4.5.6 Spent Ore and Legacy Tailings Removal in Meadow Creek Valley

The Meadow Creek Valley contains legacy materials created from historical mining activities. Legacy materials include development rock, spent ore in the unlined SODA, the Bradley Mill Tailings, and run-of-mine and crushed ore in the historical lined heap leach pads. An Environmental Legacy Management Plan (Perpetua 2021d) describes procedures and methods for active management of legacy materials encountered during construction and mining operations. While the TSF is being built and expanded, Perpetua would remove and reuse as construction material the 7.5 million tons of spent ore within the unlined SODA and other areas (Hecla and Stibnite Mine Inc. leach pads). Physical and chemical testing of the legacy material would determine if the material were suitable for construction uses and determine the final placement of the material. During the first four years or so of ore processing operations, Perpetua would remove and reprocess the three million tons of Bradley tailings underlying the SODA. The legacy tailings would be mixed with water and then pumped to the ore processing facility. The temporary water addition and pumping facility would be an enclosed, heated structure located within the limits of the SODA.

If other legacy materials are encountered during construction they would be removed and hauled off site to an appropriate disposal facility, placed in the TSF, used as pit backfill or construction material, or left in place, depending on testing to determine physical and chemical suitability.

Legacy development rock not used for TSF construction purposes or reprocessed would be placed in pit backfills or used for the TSF Buttress.

2.4.5.7 Ore Processing

During operations, approximately 115 million tons of ore would be mined from the three proposed pits and processed at the mill facilities during the approximately 15-year process facility operation. At full operation, targeted ore production would range from 20,000 to 25,000 tons per day, which would be transported to the processing facility to separate the gold, silver, and antimony from the ore. Additional details on ore processing can be found in section 17 of SGP’s updated feasibility study (M3 2021).

Ore feed for processing would be sourced from either the open pits, Bradley tailings, the SODA, the short-term stockpiles, or long-term stockpiles. Typically, ore would be hauled directly from the pits to the primary crusher whenever the mill is capable of receiving the ore based on grade and metallurgy. If the ore requires short-term stockpiling due to process constraints or haul truck congestion at the primary crusher, it would likely be placed in the short-term stockpile. Ore that is lower value than other ore available at the time of pit mining would be placed in long-term stockpiles.

Ore would be hauled to the crusher, either directly from one of the three open pits or from the ore stockpiles and would be crushed and ground to reduce the size of the rock to separate the gold, silver, and antimony-bearing minerals from the host rock. The ore processing flow sheet is shown on Figure 2.4-9. The ore processing facility and associated support infrastructure are shown on Figure 2.4-2.

The ore processing area would be designed to provide for containment of ore processing materials, chemicals, wastes, and surface runoff. Potentially hazardous chemicals and wastes would be stored within buildings or areas with both primary and secondary containment. Surface runoff within the ore processing
area would be directed to a contact water pond for collection. Any leaks or spills escaping both primary and secondary containment would flow to the contact water pond for collection and would not discharge off site.

The processing would result in production of an antimony mineral concentrate, gold- and silver-rich doré, tailings, and other waste products. Tailings disposal is discussed in Section 2.4.5.1, Tailings Storage Facility.

**Crushing and Grinding**

Mined ore would be hauled to the crusher and typically direct-dumped into the jaw crusher or stockpiled at the uncovered run-of-mine stockpile area near the crusher. Stockpiled ore would be loaded into the crusher dump pocket, based on crusher availability, using a loader. Surface water runoff from the run-of-mine ore stockpile area would be captured and directed to a pond and be used in the ore processing facility (Section 2.4.5.10).

Following crushing, the crushed ore would be transported via conveyor to a dome-shaped, covered stockpile. Dust emission controls would reduce dust from crushing, conveying, and stockpiling. Apron feeders below the crushed ore stockpile would convey the ore to a semi-autogenous grinding mill followed by a ball mill for additional size reduction of the ore. Grinding would occur within an enclosed building to reduce noise levels and facilitate maintenance of the milling equipment. Grinding with process water would reduce the ore to the size of fine sand in a water slurry for further processing.

**On-site Lime Generation**

Ground limestone and lime are needed for pH adjustment in the SGP ore processing plant. Rather than trucking these materials to site from an off-site source, a limestone bed in the West End pit is of suitable quality and quantity to satisfy the life-of-mine SGP requirements for lime. Over the life of the mine, approximately 130,000 to 318,000 tons of limestone would be mined annually, averaging approximately 240,000 tons per year. Approximately 25 to 30 percent of the limestone mined annually would be crushed and run through an on-site lime kiln to produce metallurgical lime powder, with the remainder (70 to 75 percent) would be crushed and stockpiled for direct use as limestone. Both ore and limestone would be temporarily stored at the run-of-mine stockpile area.

The on-site lime generation would require additional equipment, which would be placed within the ore processing area. This equipment would include: limestone crusher and conveyor, propane-fired kiln (200 tons per day output capacity), kiln combustion air system including preheat heat exchanger, propane storage tank plus vaporizer, air compressor, receivers, and dryers for plant air and instrument air at kiln area, roll crusher for kiln product discharge, conveyors for moving feed and product materials, off-gas fume filter for kiln discharge, dust collector kiln feed bin, storage bin for kiln feed material; and storage bin for lime products. The limestone crusher, screens, conveyors, and feed bins would not be enclosed. Dust would be controlled in a similar manner to the ore crushing and conveying process through the use of water sprays and/or bag house dust collectors.
Figure 2.4-9
Overall Process Flow Diagram
Stibnite Gold Project
Stibnite, ID

Data Source: Perpetua 2021
Antimony Flotation

Two flotation circuits would be utilized; one circuit produces an antimony concentrate, and the other produces a gold-rich sulfide concentrate. Ore high in antimony would be processed by the antimony circuit to produce an antimony concentrate (M3 2021). Following grinding, the ground ore slurry would be mixed with lime and small amounts of sodium cyanide or equivalent to inhibit flotation of the gold-bearing minerals (pyrite and arsenopyrite). Lead nitrate or equivalent would be added and then a sulfur- and phosphate-bearing organic chemical. These chemicals make the stibnite mineral particles hydrophobic where the particles then attach to air bubbles and float to the surface in the stibnite flotation tanks. The gold-bearing mineral particles which do not adhere to the bubbles in the stibnite flotation tanks would drop to the bottom of the flotation tanks and be routed to the subsequent gold flotation circuit for further processing. The antimony flotation facility would have interior curbing high enough to contain 110 percent of the volume of the largest tank.

The stibnite-laden bubbles form a froth and would be collected from the top of the stibnite flotation tanks. The stibnite concentrate froth would be subjected to one or two additional flotation steps to further clean the concentrate. The resultant antimony-rich concentrate would be finally thickened and filtered. The final antimony concentrate would be placed in 2-ton supersack containers ready for shipment off site for further refining.

Antimony Concentrate Transport

The antimony concentrate would contain approximately 55 to 60 percent antimony by weight. The remaining balance, 40 to 45 percent by weight, of the concentrate includes sulfur and common minerals with trace amounts of gold, silver, and mercury. As described in the Transportation Management Plan (Perpetua 2021e) for transportation of antimony concentrate, Perpetua would load the sealed 2-ton super sacks containing the concentrate into a shipping container at the processing facility. Perpetua would load the concentrate by forklift and hooked lifting racks to safely move the super sacks, which are equipped with lifting straps, into fully enclosed shipping containers for the full course of their transport from the SGP site to their final destination. The supersacks and shipping container would provide primary and secondary containment for the antimony concentrate (Perpetua 2021e). The concentrate would be trucked via SH 55 to a commercial truck, train, barge, ship loading facility depending on the refinery location. An estimated one to two truckloads of antimony concentrate would be hauled off site each day. It is assumed that the concentrate, when sold, would be shipped to facilities outside of the U.S. for smelting and refining because there are currently no smelters in the U.S. with capacity for refining the antimony concentrate.

Gold and Silver Flotation

Low-antimony mill feed would be processed in the gold flotation circuit only, bypassing the antimony circuit (M3 2021). Gold and silver flotation is a process similar to that described for stibnite flotation, and would be housed in the same building, but using different chemicals to float pyrite and arsenopyrite, the minerals that contain the gold and silver. The flotation building would have interior curbing high enough to contain 110 percent of the volume of the largest tank. The flotation froth, with particles containing gold and silver, would be collected and pumped to the gold concentrate thickener to further separate the gold/silver mineral particles from the process water which would be recycled. The particles from gold
flotation that do not float would become the tailings slurry. The gold and silver concentrations of the tailings would be regularly monitored and, if the concentrations are high enough to warrant further processing, they would be sent to the leaching circuit; otherwise, the tailings would be thickened to recycle additional process water and then routed to the TSF as described below.

**Oxidation and Neutralization**

An autoclave system would be used to oxidize the sulfide minerals comprising the gold and silver concentrate to liberate the gold and silver for subsequent leaching. Before the gold concentrate is pumped into the autoclave, it would be mixed with appropriate amounts of ground limestone to maintain a constant free acid level of approximately 10 grams per liter in the autoclave. This value was established through bench and pilot-scale metallurgical testing to promote the formation of stable, crystalline arsenic compounds in the autoclave. Oxygen would be injected into the autoclave to promote the oxidation reaction, and the temperature in the autoclave would be maintained at approximately 220 degrees Celsius. Water would be injected into the autoclave as needed to control the temperature. After pressure oxidation, the acidic slurry containing gold and silver would be neutralized using slurried lime and other chemicals and cooled in two forced draft cooling towers. The neutralized slurry would then be sent to the leach circuit for recovery of gold and silver from the slurry.

When increasing arsenic levels are observed, the oxidized slurry would be treated with hot arsenic cure (HAC) prior to neutralization. Metallurgical tests showed that this process promotes formation of the stable crystalline form of the arsenic precipitate enhancing environmental stability of arsenic.

The autoclave system would be housed in a steel frame building set on concrete foundations, with interior curbing to provide secondary containment. Air emissions from the pressure oxidation facility would be captured in a series of air pollution controls, and the material collected would be disposed of as a solid waste or a hazardous waste depending on the waste characterization.

**Gold and Silver Leaching and Carbon Adsorption**

The gold and silver leaching component of the recovery process would be regulated by IDEQ under the Cyanidation Rule (Idaho Administrative Procedures Act [IDAPA] 58.01.13) and would be designed and operated consistent with the International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold which is described in Section 3.7.3 (Perpetua 2021a). Gold and silver leaching and carbon adsorption would occur in a steel frame building set on concrete foundations, with secondary containment of 110 percent of the volume of the largest tank and could include audible alarms, interlock systems, and/or sumps, as spill control measures (Initiative for Responsible Mining Assurance 2018).

The leaching to recover gold and silver from the oxidized gold and silver concentrate slurry would occur in large carbon-in-pulp (CIP) tanks which would be fully contained to capture, retain, and recycle process solutions. Sodium cyanide would be added to the tanks containing the neutralized solution to form a gold-silver-cyanide complex and activated carbon would then be added to the tanks to promote the adsorption of the gold-silver-cyanide complex onto the carbon (Figure 2.4-9). The pH of the slurry in the leach circuit would be closely managed at an elevated level to maintain the cyanide in a stable soluble form.
The loaded carbon with gold-silver-cyanide complex attached would then be collected on screens and sent to the carbon stripping circuit. Inside sealed tanks, the carbon with the gold-silver-cyanide complex would be washed with an acid solution to remove impurities, rinsed with fresh water, and stripped of the gold using a hot alkaline elution solution. The resulting gold and silver-bearing elution solution would be piped to the electrowinning and refinery area.

The acid solution used during carbon stripping would be reused until it loses its effectiveness. The solution would be neutralized and sent to the tailings thickener for pumping to the TSF. Air emissions from the leaching facility would be captured in a series of air pollution controls, and the material collected would be disposed of as a solid waste or a hazardous waste depending on characterization of the waste.

**Gold and Silver Electrowinning and Refining**

The gold and silver electrowinning and refinery facility would be a closed-circuit system with 110 percent containment of the largest vessel. The elution solution pumped into electrowinning cells which would electrolytically precipitate the precious metals into a solid sludge that would be removed from the elution solution with a filter. The solid precipitate would then be heated in a retort system to drive off and collect any contained mercury. The gold and silver precipitate from the retort would then be mixed with flux and then placed into an induction furnace and heated. The molten material from the induction furnace, consisting of gold and silver metal and slag, would be poured into molds to cool. The slag would be recycled within the mill circuit and the doré gold/silver bars would be shipped off site to refineries for further processing and refining.

Air emissions from the induction furnace and retort would be treated in a series of emission controls. Mercury metal would be securely stored prior to shipment to a certified hazardous waste disposal facility.

**Tailings Neutralization Circuit**

Cyanide-bearing process slurry from the carbon-in-leach (CIL) circuit would be neutralized within the ore processing plant to less than approximately 10 milligrams per liter weak acid dissociable cyanide before being pumped to the TSF. Residual cyanide in the slurry would be treated using a sodium metabisulfite and air system to oxidize cyanide to form cyanate. After neutralization, tailings would be routed to one or more tailings thickeners, to partially dewater the tailings before they are pumped to the TSF. The process water separated from the thickened tailings slurry would be recycled within the ore processing facility. The neutralized and thickened tailings slurry would be pumped to the TSF.

**Tailings Pipeline Maintenance Pond**

Lined tailings pipeline maintenance ponds would be located at the truck shop and at the ore processing facility, to which tailings slurry from the tailings pipeline between the mill and the TSF or and process water from the tailings reclaim pipeline could drain by gravity during maintenance shutdowns or if there were a leak in either pipeline. The ponds would typically be empty except during maintenance or unforeseen problems with the tailings or reclaim water pipelines, pumping system, or TSF. The ponds are designed to contain the contents of the pipelines and the runoff from the pond and open-trench portions of the lined pipeline corridor from a 100-year, 24-hour storm event plus snowmelt.
### 2.4.5.8 Tailings Storage Facility

The TSF would be located on NFS lands within the Meadow Creek valley (Figure 2.4-2). The TSF, its embankment, and associated water diversions would occupy approximately 423 acres at final buildout with approximately 405 acres of new disturbance. Perpetua has conducted geotechnical and geophysical investigations to support the design of the TSF and associated buttresses. The TSF at the end of operations would be capable of holding approximately 120 million tons of tailings, the operational water pool, and precipitation falling within the TSF and contributing watershed up to the 24-hour Probable Maximum Precipitation event of 11.74 inches of rainfall. Additional details on ore processing can be found in section 18 of SGP’s updated feasibility study (M3 2021).

The TSF would consist of a rockfill embankment, a fully-lined impoundment, and appurtenant water management features. The TSF Buttress located immediately downstream of, and abutting against, the TSF embankment would substantially enhance embankment stability.

Design criteria were established based on the facility size and risk using applicable dam safety and water quality regulations and industry best practice for the TSF embankment on a stand-alone basis; the addition of the buttress substantially increases the safety factor for the design to about double the minimum requirements. The upstream face of the TSF embankment and the Meadow Creek valley where the TSF impoundment would be located would be fully lined to minimize leakage. The TSF would be surrounded by an 8-foot high, chain-link fence designed to keep wildlife, such as deer and elk, from entering the impoundment area. The TSF includes an engineered, rockfill starter embankment. Historical development rock (i.e., waste rock), spent ore from the historical SODA and heap leach areas, and development rock from mine pits would be used for the TSF embankment construction. The TSF Buttress would be built by first constructing a ramp along the north side of the valley to access the crest of the TSF embankment and upper portions of the buttress (Figure 2.4-10). Historical spent ores from the SODA and Hecla heap leach would be placed as bedding on the upstream face of the embankment or impoundment fill prior to placement of the liner to minimize interaction with infiltrating surface water. The starter embankment would be constructed to an elevation of 6,850 feet (or 245 feet above the existing ground surface). The TSF Buttress would then be constructed upwards to further access TSF embankment lifts while the base expands down the valley (eastward) as historical spent ore and legacy tailings are removed from the valley bottom. Engineered fill would be placed against steep slopes within the impoundment to flatten and smooth slopes to facilitate liner placement. This method of construction would allow for controlled material placement across the valley from the ramp north of the valley to the south side. The TSF Buttress would provide additional short- and long-term geotechnical stability. The final embankment height would be 475 feet at a crest elevation of 7,080 feet (Figure 2.4-11).

#### TSF Underdrain System

The TSF would have an underdrain groundwater collection and conveyance system located beneath the liner. Prior to construction, the area would be evaluated for springs and seeps. Evaluations would consist of visually identifying intermittent wet areas (seeps), areas with flowing water (springs), or areas supporting increased plant growth when compared to surrounding areas (see section 18 of M3 2021 for additional detail).
Figure 2.4-10
TSF and TSF Buttress Cross-Sections, Years -1 to 3
Stibnite Gold Project
Stibnite, ID

Data Sources: (Perpetua 2021a)
Figure 2.4-11
TSF and TSF Buttress Cross-Sections, Years 4 to 12
Stibnite Gold Project
Stibnite, ID

Date Sources: (Perpetua 2021a)
Groundwater underdrains would be a series of parallel drains with branching laterals, instead of a single valley bottom drain, due to the broad u-shaped nature of the Meadow Creek valley (Figure 2.4-15). Pipes would transition from perforated (able to collect groundwater) to solid-wall (for conveyance only) as they exit their respective collection areas (impoundment and embankment) and flow underneath the buttress to the outlet. Underdrain flows would be collected in a sump downstream of the toe of the buttress, monitored for water quality, then either discharged to surface water through a permitted Idaho Pollution Discharge Elimination System (IPDES) discharge, or pumped to the ore processing facility or a contact water pond for either treatment and discharge or use as makeup water for the mill process. The TSF liner system would then be installed in the TSF impoundment area over the underdrain system.

Underdrains would be installed beneath the TSF Buttress to ensure that groundwater does not saturate the base of that fill and potentially lead to water quality impacts or geotechnical instability; however, little if any flow is expected in the buttress underdrains owing to lower observed groundwater levels beneath the buttress. Underdrain collection sumps and downgradient monitoring wells would be used for TSF leak detection.

**TSF Liner System**

Due to water quality regulations and the presence of dissolved metals (chiefly arsenic and antimony, with trace mercury) and residual cyanide in the tailings pore water and supernatant pool, the TSF impoundment (including the upstream embankment face) would be composite-lined with geosynthetic materials to prevent seepage of process water or transport of tailings out of the facility. A network of geosynthetic drains would be placed above portions of the geomembrane liner to reduce hydraulic head on the liner and excess pore pressure in the overlying tailings. The drains would report to a sump near the upstream embankment toe, and the water would be pumped out to the pool or reclaim system for reuse (M3 2021).

A composite liner consisting of a 60-mil, single-sided, textured, linear low-density polyethylene liner over a geosynthetic clay liner (GCL) would be employed to contain the tailings. Before placement of the liner within the TSF, the subgrade would be re-worked and compacted, or a minimum of 12 inches of buffer/liner bedding fill would be placed. Geosynthetic overliner drains would be placed above portions of the liner to reduce hydraulic head on the liner and pore pressure in the overlying tailings solids during operations. The drains would direct water that migrates through the tailings to a sump near the upstream toe of the embankment, and the water would then be pumped out to the tailings pool within the impoundment or the reclaim system for reuse in the mill.

Facilities that use cyanide in their mineral extraction process are required to obtain a permit from the Idaho Department of Environmental Quality (IDEQ) and follow the Rules for Ore Processing by Cyanidation (IDAPA 50.01.13). The IDEQ entered into rulemaking on the existing regulations to change the regulatory requirements from prescriptive requirements to performance-based requirements. A temporary Rule went into effect in October 2020, and the final rule was approved by the legislature in 2021. The liner system proposed for the SGP meets the requirements of the rule under which the Project’s Cyanidation permit is expected to be issued.
**TSF Management Support Facilities**

Light vehicle roads and haul roads would provide access between the ore processing facility and the TSF, and the tailings delivery and reclaim water return pipelines would parallel the haul road. Secondary containment in the event of a pipeline break would consist of a geosynthetic wrap or an open geosynthetic lined trench. Further, the pipeline corridor would drain to one of two pipeline maintenance ponds – one at the truck shop and one at the ore processing facility. Electrically-powered pumps would be located at the TSF to pump tailings to the TSF and reclaim pumps would be located at the TSF to return water to the ore processing facility for reuse.

**TSF Water Management**

Thickened tailings slurry would be pumped to the TSF (see section 18 of M3 2021 for additional details). The TSF would be designed and operated as a closed-circuit, zero-discharge facility meaning no tailings water would be discharged to the surface water or groundwater except in compliance with applicable permits and regulations. As the tailings consolidate, water collected in or falling on the surface of the TSF would form the supernatant pool on top of the tailings and be reclaimed for use in ore processing. Cyanide levels in the TSF reclaim water would be monitored throughout operations to ensure they remain in compliance with issued approvals and permits.

### 2.4.5.9 Mine Support Infrastructure

SGP infrastructure to support surface mining and ore processing operations would include the following:

- A one-story mine administration building that would be sided or painted and roofed in neutral colors.

- A maintenance workshop which would store materials and supplies as discussed in Section 2.4.5.14, Materials, Supplies, Chemical Reagents, and Wastes.

- A truck wash facility which would include an oil/water separation system and water treatment facilities to enable recycling of the wash water.

- A worker housing facility ([Figure 2.4-12](#)), which would be constructed on NFS lands adjacent to Thunder Mountain Road (FR 50375) and would accommodate up to 500 people. This facility would include dormitories, food service, and recreation facilities, along with the supporting infrastructure of power, water supply, and wastewater treatment plant. The SGP main gate and security building would be co-located with the worker housing facility.

- Haul roads to transport ore, development rock, and reclamation materials from mining or storage areas, and to transport vehicles to the maintenance workshop. A typical haul road travelway would be approximately 87 feet wide (81.1 feet of running surface and 5 feet of safety berm width). The haul roads would be built and maintained for year-round access and would be surfaced with gravel materials. Road maintenance activities would be conducted to manage fugitive dust emissions and maintain stormwater management features.
Figure 2.4-12
Worker Housing Facility
Stibnite Gold Project
Stibnite, ID

Data Sources: Perpetua
• Culverts would be installed where haul roads cross drainages or to direct stormwater to collection and retention structures. Culvert inlets and outlets would be lined with rock riprap, or equivalent, as needed to prevent erosion and protect water quality. Crossings of known fish-bearing streams would be constructed to support fish passage, with appropriately designed and constructed culverts or bridges.

• Service roads and paths that would provide an internal access system for employees and visitors to the site. The service roads would typically be 12 to 15 feet wide; some would be graveled or covered with rock aggregate, while others would be two-track roads. There would be no planned public use of the SGP service roads or trails. The path system would enable SGP pedestrian traffic to move safely throughout the SGP operating area. Service roads and paths would be located within the overall disturbance area defined for the SGP and existing roads would be used to the extent possible.

• Employee and visitor parking that would be maintained during construction and operations. During construction, the gravel parking areas would be located at the new worker housing facility, near the contractor/construction laydown areas, and at the Scout Portal. As operations are initiated, gravel parking areas would be maintained for buses, vans, and other miscellaneous vehicles for employees, contractors, vendors, and visitors at the new worker housing facility, at the shop area, and near the mine administration office.

2.4.5.10 Surface Water and Groundwater Management

Surface Water Management

To manage surface water at the SGP, existing streams that run through areas proposed for mining related disturbance would be diverted. Temporary diversions would be used within the SGP to keep non-contact water separated from contact water. Contact water is water that flows into or through disturbed areas and mining facilities and could have the potential to pick up increased levels of sediment, metals, and other possible contaminants which cannot be discharged into surface water and groundwater without proper treatment. Non-contact water is meteoric water that does not contact disturbed areas or mining facilities.

Stream Diversions around Mining Features

Existing streams would be temporarily diverted around SGP facilities, within constructed surface water channels. Diversion channel segments constructed in erodible materials would be lined with riprap to prevent erosion. Rock-cut channels would be constructed on steep slopes and in areas with shallow or at-surface bedrock, would have low erosion potential, and not require riprap lining. Certain channel segments constructed over fill or excavated in permeable materials would be lined with a geosynthetic liner to prevent seepage. A geotextile and/or transition layer of sand/gravel followed by riprap would be placed over the liner for erosion protection. Certain diversion sections would be piped as dictated by terrain or the need to limit warming of water.

During mine operations, summer low flows in perennial diversion channels around the TSF impoundment and buttress (Meadow Creek), Yellow Pine pit (Hennessy Creek), and West End pit (West End Creek) would be piped underground as an environmental design feature to maintain cold stream temperatures.
Eight- to 12-inch-diameter pipes, sized to convey August baseflow, would be installed under the diversion channels in the riprap channel lining or under the adjacent access road to carry low flows. Stream flow would enter pipes through inlets at the same locations stream and tributary inflows would be diverted into the constructed channel. Some diversions, such as portions of Hennessy and West End Creeks, and the East Fork SFSR tunnel, would be entirely underground, in which case conduits would be larger and sized for high flows.

**East Fork SFSR Temporary Diversion Tunnel**

Currently, the East Fork SFSR flows into and through the Yellow Pine pit lake. The cascade at the inflow to the pit lake currently blocks upstream fish passage. A tunnel would be built to direct the East Fork SFSR around the west side of Yellow Pine pit to allow mining in the pit and fish passage during construction and operations (Figure 2.4-13). The tunnel would be approximately 0.9 mile long and 15 feet high by 15 feet wide. The tunnel would include a fishway stream channel designed to provide for upstream and downstream passage of migratory and anadromous salmonid fish.

The tunnel would be designed so that fish could swim through its entire length in both directions (Brown and Caldwell, McMillen Jacobs and BioAnalysts 2021a). To encourage fish passage, low-energy lighting would be installed in the tunnel and set on timers to simulate daylight. A trash rack would be constructed near the upstream entrance to the tunnel to prevent large wood, boulders, and other debris from entering the tunnel, and would be cleaned periodically. The spaces between the trash rack bars would be sized to allow passage of adult Chinook salmon. A surface water supply intake with fish screens would be installed upstream of the trash rack at a control weir to divert water from the East Fork SFSR for ore processing makeup when necessary.

A parallel roadway would be constructed in the tunnel to allow equipment and personnel access for monitoring, inspection, and maintenance. The accessway would function as a floodway for high flows, greater than the normal flow range within the fishway.

The tunnel fishway would incorporate concrete weirs, designed to produce hydraulic conditions that could be successfully navigated by fish (McMillen Jacobs 2018). The south portal (upstream end) of the tunnel would include a sediment collection and drop out area, a resting pool, trash rack, flow control weir, and picket panels. The north portal, located at the downstream end of the tunnel, would include an orientation pool for downstream migrating juvenile fish with an adult exclusion barrier to reduce potential predation, a separate adult fish holding/resting pool, rock weirs and a transition zone. Specific details on the north and south portals, plus the overall design, function, operation, and maintenance of the diversion tunnel are thoroughly described in the Fishway Operations and Management Plan (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021a).

**Midnight Creek**

Midnight Creek is a first order, perennial, non-fish-bearing stream. The Midnight Creek stream diversion would reroute approximately 0.3 mile of the lower portion of Midnight Creek to the south, away from where it currently enters the Yellow Pine pit lake. The rerouted creek would be piped under haul roads so that it would enter the East Fork SFSR upstream of the proposed tunnel portal (Figure 2.4-14). The Midnight Creek diversion would manage flows in Midnight Creek during Yellow Pine pit operations and
backfill activities until the newly developed East Fork SFSR alignment over the backfilled pit is complete and stabilized as described in Section 2.4.7.4.

**Hennessy Creek**

Hennessy Creek is a first order, perennial, non-fish-bearing stream. Hennessy Creek would be diverted south of Yellow Pine pit in a pipe along the public access road at the western edge of the pit (Figure 2.4-13). The diversion would include an impounding structure, overflow weir, and diversion cleanout basin. Diverted flows would be routed to Fiddle Creek downstream of the existing Stibnite Road culvert crossing, ultimately placing Hennessy Creek flows into the East Fork SFSR upstream of the south tunnel portal and disconnecting flow from the current unlined ditch passing alongside the Northwest Bradley dumps. Overflow, if any, would follow the existing stream channel into the Yellow Pine pit.

**Fiddle Creek**

Fiddle Creek is a second order, perennial, fish-bearing stream. Fiddle Creek would not be diverted. Rather, small stormwater diversions would route hillslope runoff around the Fiddle GMS and a culvert would route Fiddle Creek under the GMS, GMS access road, and public access road.

**West End Creek**

West End Creek is a first order, non-perennial, non-fish-bearing stream. The approximately 1.5-mile-long West End Creek stream diversion would reroute West End Creek around the north side of the legacy West End DRSF and cross the upper benches of the West End pit (Figure 2.4-14). The diversion would consist of a lined channel along the upper legacy DRSF, and a pipe in the segments along a steep hillside above the West End pit, within the pit, and along the steep hillside alongside the lower legacy DRSF down to the outlet at the existing stream channel. The lined channel portion would be designed to convey flows from a minimum 25-year storm event plus 2 feet of freeboard.

**Garnet Creek**

Garnet Creek is a perennial, first order, non-fish-bearing stream. During construction, Garnet Creek would be re-routed downstream of the ore processing facility to a relocated confluence with the East Fork SFSR (Figure 2.4-14). Above the early restoration reach, Garnet Creek would be routed along the upper processing plant site access road in a riprap channel, then cross under the ore processing facility roads in culverts, with environmental design features to reduce sediment loading to the stream, and to protect water quality. At closure, this segment of Garnet Creek would be restored, along with created wetlands at the plant site.

**Meadow Creek**

Meadow Creek is a perennial, third order, fish-bearing stream. Approximately 2 miles of Meadow Creek would be diverted around the south side of the TSF and TSF Buttress. The diversion would direct flows back into the existing SODA diversion upstream of the Hangar Flats pit (Figure 2.4-15). The new diversion would consist of a rock-cut channel in segments along the steep hillsides above the TSF and buttress, and an excavated channel in alluvium across tributary valley segments. Channel segments
excavated in erodible or permeable materials would be lined with rock riprap and/or geosynthetic liner to prevent erosion and to minimize seepage where needed. The Meadow Creek diversion channel around the TSF and TSF Buttress would be designed to convey flows from a minimum 100-year storm event with 1 foot of freeboard.

The stream also would be diverted around the Hangar Flats pit. The Meadow Creek channel would be moved away from the pit to the south/southeast and reconstructed as a sinuous channel and floodplain to allow potential for spawning habitat and establishment of riparian habitat within the floodplain. A liner would be installed under the stream/floodplain corridor to minimize water seepage into the Hangar Flats pit or the pit dewatering well system, and to avoid potential pit wall instability or loss of stream habitat as a result of stream dewatering. The Meadow Creek diversion channel/floodplain corridor around the Hangar Flats pit would be designed to convey flows from a minimum 100-year storm event with 3 feet of freeboard; as a natural channel design, the stream channel itself would be designed for bankfull flows (1.5-year recurrence). This diversion would be permanent and incorporates design aspects to resemble natural channels not applied to temporary diversions of the other creeks. This permanent design accounts for channel migration, flooding, riparian development, and biological habitat.

**Blowout Creek**

Blowout Creek is a first order, perennial, fish-bearing stream outside the Project operational footprint. Blowout Creek (aka East Fork Meadow Creek [EFMC]) was impacted by the failure of a water storage dam in 1965 creating a steep actively eroding channel that conveys Blowout Creek. Perpetua proposes to stabilize and repair the failed area of Blowout Creek in the actively eroding chute and raise groundwater levels in the meadow upstream of the former dam site to restore wetland hydrology. A structure to control the grade of the creek would raise groundwater levels in the meadow and a coarse rock drain would address ongoing erosion of the channel side slopes that currently deliver sediment directly to the creek, while facilitating construction of a permanent surface channel. This would be an SGP environmental design feature and restoration effort, as the Blowout Creek chute and upper meadow are unrelated to and unaffected by the proposed mine features. The lower portion of the Blowout Creek alluvial fan would be an important borrow area for this and other restoration projects and is included in Project disturbance.

During construction and early mining, Perpetua would construct grade control and water retention features near the old reservoir water retention dam location to elevate the groundwater level and stream water surface sufficiently to restore wetland hydrology in the surrounding meadow. The retention structure would impound portions of the meadow channel, which would fill with sediment over time.

A coarse rock drain would be constructed within the chute downstream of the failed dam site to isolate the flow of Blowout Creek from the actively eroding chute side slopes and to prevent further erosion of the gully bottom, facilitating subsequent restoration of a surface channel on top of the drain. The rock drain would also provide area for the collection and retention of side-slope erosion material rather than allowing that material to potentially contribute sediment to Blowout Creek. As the rock drain fills with sediment, it would become closed off from the stream channel and flow would revert to the designed surface channel.
Figure 2.4-13
Cutaway View of Fish Passage Tunnel
Stibnite Gold Project
Stibnite, ID
Data Sources: Perpetua 2021a
Figure 2.4-14
2021 MMP Water Management Plan - East Fork SFSR below Meadow Creek
Stibnite Gold Project
Stibnite, ID

Legend
- Dewatering Well
- Tanks
- Pit Sump or Pump Station
- Tailings Pipeline
- Contact or Water Supply Pipeline
- Contact Water Pond
- Clean Water Diversion (ditches or pipes)
- Diversion Tunnel
- Stream

IPDES Outfalls
- Proposed Plant Site IPDES Construction/Operations Outfall

Data Source: Perpetua 2021a
Figure 2.4-15
2021 MMP Water Management Plan - Meadow Creek Stibnite Gold Project Stibnite, ID

Data Sources: (Perpetua 2021a)
The existing alluvial fan in lower Blowout Creek, located adjacent to Meadow Creek, would be removed, mostly during mine operations for borrow materials, and the area reclaimed. A surface diversion would be constructed at the margin of the lower alluvial fan to facilitate borrow excavation, and this stream reach subsequently restored.

Non-Contact Stormwater Diversions

Non-contact stormwater is meteoric water (i.e., precipitation) that does not contact tailings, open pits, the TSF, TSF Buttress, spent heap leached ore, and tailings from past mine operations, or any other mining related surfaces. Stormwater runoff from undisturbed areas upslope of mine features in the major drainages would be captured in stream diversion channels described above or in other channels that would direct runoff away from mine disturbed areas. Smaller-scale diversion channels or earthen berms would be used, where necessary, to divert stormwater around other mine infrastructure. Non-contact water would be managed with features to reduce erosion and sediment delivery to streams. Where sedimentation is a concern, non-contact water stormwater diversions would be routed to sediment catch basins where the water can evaporate, infiltrate, or discharge into the stream system after settling. Energy dissipation structures would be installed at the non-contact surface outfalls as needed.

Contact Water

Water that contacts mining disturbances and has the potential to impact water quality is termed contact water. Contact water includes, but is not limited to, runoff from mine facilities such as the TSF, TSF Buttress, stockpiles, mine pits, haul roads constructed of development rock, toe seepage of precipitation infiltrating through the stockpiles, and underground exploration water. Collection of contact water would begin during the first year of on-site construction and would continue throughout operations and the closure and reclamation phases. Contact water would be captured in channels and sumps and routed to the ore processing facility, contact water storage ponds, water treatment plant, or enhanced evaporation systems. In unusually high runoff periods collected water may be allowed to remain in the pits or the TSF temporarily, excess contact water from outside of the pits may be routed to mine pits for temporary storage. Contact water storage ponds would be lined to minimize leakage. Water in the contact water storage ponds could be pumped to the mill for use, treated and discharged in accordance with applicable requirements, or evaporated. Contact water in the mine pits would be directed to in-pit sumps in the lowest part of the pit and piped to the mill for use, to other contact water storage ponds, to water treatment or evaporation, or into trucks for spraying for dust control within open pits and on stockpiles or TSF Buttress. Any contact water beneficially used in the ore processing or for dust control or stored for more than 24 hours then treated and discharged would require water rights permitting through the IDWR prior to use.

Contact water which exceeds regulatory discharge standards set by IDEQ and that cannot be used during operations would be disposed through a variety of methods including forced evaporation using sprayers located within the TSF or other managed areas or treated and discharged. Water would be treated to meet IPDES permit limits and treated water would then be discharged through IPDES permitted outfalls to the East Fork SFSR or Meadow Creek.

Runoff from haul roads and access roads outside of pits, ore stockpiles, or development rock storage areas may be of sufficiently good quality to be eligible for coverage under the Multi-Sector General Permit
(MSGP) for Stormwater Associated with Industrial Activities. Eligibility would depend upon the materials used for road construction and would be determined through coordination with IDEQ with oversight by EPA. Runoff covered under the MSGP would be managed with a variety of environmental design features and conventional stormwater control measures to ensure the protection of surface water quality.

Surface Water Outfalls

The specific number and exact locations of outfalls would be determined via IPDES permitting through IDEQ. Approximate locations of the anticipated outfalls described below are shown on Figure 2.4-14 and Figure 2.4-15. All outfalls would be required to meet water quality limits for specific constituents, and some outfalls may have discharge volume limits where the permit specifies a loading limit. Not all outfalls would necessarily be active or be permitted in the same permit cycle.

Two IPDES surface water outfalls would be used to discharge treated contact water from active mine pits, the TSF Buttress, pit dewatering, legacy mine materials disturbed by new mining activities, and the plant site and truck shop. One outfall located near the plant site would discharge to the East Fork SFSR. A second outfall would discharge to Meadow Creek upstream of Blowout Creek to augment streamflow during pit dewatering.

Water from the TSF and TSF Buttress underdrains may be discharged from two outfalls shown on Figure 2.4-15, depending on whether IPDES discharge limits are met without treatment of the underdrain water (otherwise, underdrain water would be routed to the plant site for use in processing, to the water treatment plant, or back to the TSF). Discharges from these two outfalls are expected to have a strong seasonal component, with some parts of the year seeing reduced flows, or even no discharge, as contact water is used for ore processing or other mine uses.

An outfall would be permitted on upper East Fork SFSR for the sanitary wastewater treatment facility at the worker housing facility. That outfall would be active through the operations period and during mine closure until the facility is decommissioned.

An additional outfall is expected to be permitted in a future IPDES permit renewal for closure and post-closure discharge of treated TSF process water. That outfall would be on Meadow Creek upstream of Blowout Creek near the TSF Buttress.

Additional permitted outfalls may be necessary during a portion of the operations period for contact water storage pond spillways that could discharge to surface water – although discharge would be very rare or non-existent, only occurring in the event of excessive precipitation or snowmelt. The need for additional outfalls associated with pond spillways and their location would be determined with IDEQ.

Each outfall would be permitted through IDEQ and would be required to be monitored, meet discharge limits, and regulate the rate of discharge.

Draining the Yellow Pine Pit Lake

Draining of the existing Yellow Pine pit lake would be initiated during construction. When the East Fork SFSR tunnel diversion is ready, stream flows would start being diverted into the tunnel during a period of
low flow, most likely in the warmer months, and concurrent with salvaging fish from the pit lake and diverted sections of the East Fork SFSR. As the East Fork SFSR water is diverted into the tunnel, the decreased East Fork SFSR flow into the pit lake would be expected to cause some fish to out-migrate, thereby lessening the number of fish requiring salvage and creating better conditions for salvaging fish.

Once fish salvage has occurred in the East Fork SFSR from the tunnel diversion downstream to the pit lake and most of the East Fork SFSR flow is being diverted into the tunnel, fish salvage in the lake would commence and take approximately one week to complete. The pit lake would drain naturally down to the elevation of the outlet of the lake, where the existing rock sill would control the water level, though some leakage and slow lowering via groundwater outflows may occur beyond that level. No erosion or downcutting of the outlet rock sill would be expected because it has endured the full range of East Fork SFSR flows over decades and both inflow and outflow rates would be minimal during draining due to the river flow being diverted into the tunnel. The drain-down process would naturally convey lake water downstream to the East Fork SFSR.

After the natural drain down, water remaining in the pit lake or entering the pit from groundwater seepage or local stormwater runoff from pre-stripping operations on the highwalls above the pit lake would be managed as mine-impacted water. The water pumped from the pit lake would be used for construction purposes, transferred to the TSF (after it is lined and available) for future use in ore processing, or treated to meet permit limits before being discharged downstream in the East Fork SFSR via an IPDES permitted outfall.

Sediment remaining in the pit lake bottom would be removed beginning near the end of the final year of construction. Approximately 80 vertical feet of sediment lies on the pit bottom, and the pit walls are too steep to operate equipment without a ramp. Therefore, removal may be staged to coincide with successively lower benches as the pit is mined, and therefore may extend into the first year of operations. During this time, the pit would be used seasonally to capture and store contact water from the adjacent pit walls, and this water would be used or managed as stated above.

The sediment would be removed using an excavator or similar equipment and loaded into trucks and delivered to the TSF. Slurry/dredging methods are not anticipated but would be considered as part of adaptive management if the sediments are too wet to load and/or blend. The truck beds would have flashboards to minimize water leakage from the low-strength, saturated sediments. The loading area would drain back into the former pit lake, preventing off-site discharge of bleed water during loading. If necessary, wet material would be blended with loose dry material (e.g., development rock) from elsewhere on site to enable better loading, transport, and ultimate stability at the destination.

**Groundwater Management**

Groundwater would require management to allow mining in the pits and to direct seeps and springs from beneath mine facilities. Groundwater also would provide a portion of the water supply for the SGP. Water supply aspects of the mine operations are described in the Water Use and Water Balance subsection below. Any groundwater used within the SGP would require permitting through IDWR prior to use. Depending on final use or disposal of groundwater, wells drilled on the site could be permitted as domestic use, industrial use, or dewatering wells.
Pit Dewatering

Lowering the water table in and surrounding the Yellow Pine, Hangar Flats, and West End pits during operations would increase pit wall stability and provide dry working conditions in the pit bottoms. Development of the Yellow Pine and Hangar Flats pits would require partial dewatering of the alluvium of portions of the East Fork SFSR and Meadow Creek valleys, respectively, to limit groundwater inflow to the pits and maintain stability of the pit slopes. Once the West End pit is mined below the level of West End Creek, the West End pit also would require dewatering.

Dewatering would be accomplished by drilling a series of alluvial and deeper bedrock wells near the pit perimeters to intercept and pump groundwater before the water reaches each pit. Alluvial groundwater at the Yellow Pine and Hangar Flats pits would be managed using a series of vertical wells (Figures 2.4-14 and 2.4-15). The West End pit is primarily in bedrock with only a thin layer of alluvium in the vicinity of the pit and no alluvial dewatering is planned for that pit. Pumps would be installed in each well and would run as necessary to draw down the groundwater and facilitate mining and backfilling operations. Horizontal drain holes in pit walls may also be considered for depressurizing remnant high pore pressure areas.

Groundwater pumped from pit dewatering would be considered to be contact water and would be managed through forced evaporation or active water treatment when the volume of pumped water exceeds the ore processing facility demand. Treated water would be discharged to either of two IPDES-permitted outfalls, either Meadow Creek or the outfall on the East Fork SFSR near the water treatment plant, depending on the need for streamflow support in Meadow Creek.

The pit dewatering wells would be permitted as industrial wells in conjunction with a water right application through IDWR.

Groundwater not captured by the pit dewatering, and entering the pits as highwall seepage, would be directed to an in-pit sump in the lowest part of the pit where it would combine with stormwater and snowmelt runoff (i.e., contact water) from precipitation falling within the pit. The water would be used for dust control within the pits, and as needed, pumped to the ore processing facility for use as makeup water. In-pit water that cannot be used would be disposed of through forced evaporation or routed to the water treatment plant then discharged to the East Fork SFSR or Meadow Creek via IPDES permitted surface outfalls.

Water Use and Water Balance

The water balance is an accounting of inflows, outflows, and storage for various components of the mining and ore processing system. Actual volumes for water balance inputs and outputs could vary seasonally and annually from the volumes estimated. A water balance flow diagram for the mining and ore processing operations phase is provided in Figure 2.4-16 with components of the water balance described below.
Figure 2.4-16
2021 MMP Water Balance
Flow Diagram (Operations)

Stibnite Gold Project
Stibnite, ID
Data Sources: Perpetua 2021a
Water Use and Supply

Sources of water are required for ore processing, surface and underground exploration, dust control, and potable use. Water for industrial and mining uses would be supplied from water pumped from the dewatering wells located around the Hangar Flats, Yellow Pine, and West End pits; industrial water supply wells; contact water storage ponds; a surface water supply intake on the East Fork SFSR; and process water recycled within the ore processing and tailings circuit. Dedicated wells would provide potable water for worker consumption and sanitary use. Projected water use for the SGP is described in Table 2.4-10.

Table 2.4-10  Estimated Gross Fresh and Recycled Water Usage

<table>
<thead>
<tr>
<th>Component</th>
<th>Construction and Start-Up (gpm)</th>
<th>Operations (gpm)</th>
<th>Closure and Reclamation (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground and surface exploration</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Surface dust control (seasonal basis)</td>
<td>33</td>
<td>66</td>
<td>16.5</td>
</tr>
<tr>
<td>Ore processing including tailings storage</td>
<td>0</td>
<td>3,900</td>
<td>0</td>
</tr>
<tr>
<td>Potable or domestic use</td>
<td>26</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Sub-Total Use</td>
<td>109</td>
<td>4,028</td>
<td>20.5</td>
</tr>
<tr>
<td>Contingency (10%)</td>
<td>11</td>
<td>403</td>
<td>2</td>
</tr>
<tr>
<td>Total Estimated Use</td>
<td>120</td>
<td>4,431</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a  
gpm – gallons per minute

As shown in Table 2.4-10, ore processing facility operations would represent approximately 97 percent of water use associated with the SGP. A separate wellfield of up to four wells would be developed in the East Fork SFSR drainage adjacent to the worker housing facility to provide potable water for the housing facility. The use of water from pit dewatering, contact water from precipitation runoff, surface water, and development of separate wellfields for supplemental industrial water and potable water at the worker housing facility would require permitting through the IDWR as new water rights or transfer of the place of use for one of Perpetua’s existing water rights. Perpetua has submitted an application to IDWR for a total diversion of up to 9.6 cfs (4,308 gpm) for use by the SGP.

Water for Ore Processing

Ore processing is the primary driver for water use. Water sources for ore processing include water from pit dewatering and water supply wells, contact water, East Fork SFSR surface water intake, and water recycled from the TSF. Outflows from ore processing include tailings slurry conveyed to the TSF and evaporative losses from various process components.

The majority of the water needed for ore processing would be recycled (reclaimed) from the TSF. Reclaim water would be pumped from the supernatant water pool at the TSF to the reclaim water tank at the ore processing facility. Makeup water would be supplied from pit dewatering in wells located around the Hangar Flats, Yellow Pine, and West End pits; water supply wells; contact water; and surface water intake in the East Fork SFSR. Water would be pumped from the pit dewatering wells to freshwater tanks.
near the ore processing facility site. These tank facilities also could supply water for exploration drilling, development drilling, in-pit road dust control, and emergency fire suppression.

The freshwater tanks could store approximately 360,000 gallons of water; 240,000 would be available for process uses, and the remaining 120,000 gallons would be maintained for fire suppression only.

**Water at the TSF**

Inflows to the TSF include tailings slurry and precipitation. The TSF would store tailings solids, water entrained with the tailings, and free water atop the tailings (supernatant pool). Stormwater falling directly on the TSF and water from the supernatant pool, that forms as the tailings consolidate, would be stored in the TSF and reclaimed for ore processing. Water infiltrating to the base of the TSF would be captured by the liner overdrains, enter a sump, and be pumped back to the supernatant pond. The volume of available reclaim water would be influenced by the ore processing volumes, precipitation, and evaporation. The reclaim water would be pumped from the TSF to the reclaim water tank located at the ore processing facility. During periods of site-wide water excess, reclaim can be curtailed and contact water could be used directly in ore processing to facilitate emptying the contact water ponds, while retaining water in the TSF for use in an upcoming dry season. Local stormwater and snowmelt runoff and the existing Meadow Creek would be routed around the TSF.

**Water for Potable Use**

Potable water would be needed for worker consumption and sanitary use. Groundwater would be the primary source of water for potable use at the SGP. An existing well located near the exploration camp in the East Fork SFSR drainage would be used to supply an independent water circuit, along with a separate wellfield in the East Fork SFSR drainage adjacent to the worker housing facility. Wells also would be drilled for potable and industrial or commercial water uses at the Burntlog Maintenance Facility and the SGLF. Perpetua has applied to IDWR for water rights for these wells.

**Water Treatment**

The project’s water treatment requirements, objectives and methods are described in detail in the Stibnite Gold Project Water Management Plan (Brown and Caldwell 2021b) and summarized in this section. Three water types would require treatment over the life of the SGP: contact water from mine facilities, which includes dewatering water (construction through closure); process water from the TSF (closure); and sanitary wastewater (construction through early closure). During operations, treating and releasing contact water would generally be limited to periods when a significant amount of dewatering water is being produced, or seasonally in wet years. Outside of that time, much of the collected contact water could be put to beneficial use in the mill. Any groundwater or contact water put to beneficial use within the SGP mine area would require permitting through IDWR prior to use. During construction and at closure, absent a water demand for ore processing, less contact water would be consumed and proportionally more would be disposed of through evaporation or treatment and discharge. From construction through early closure, the camp and offices would produce sanitary wastewater needing treatment. Additional water treatment that could be required during post-closure is discussed in Section 2.4.7.13, Post-Closure Water Treatment. Permit discharge limits would be developed according to IDEQ and CWA requirements and the limits would be established by the IPDES permit issued by the IDEQ.
The sources proposed for operational water treatment by Perpetua include:

- Contact water from dewatering of the Yellow Pine, Hangar Flats, and West End pits;
- Stormwater runoff (including snowmelt) from the pits, TSF Buttress, Bradley tailings, SODA, Hecla heap leach, run-of-mine ore stockpile area, truck shop, and ore processing facility;
- Toe seepage from the TSF Buttress and long-term ore stockpiles; and
- Sanitary wastewater from the worker housing facility, truck shop, ore processing facility, and administrative buildings.

The conceptual water treatment system during operations would need to adhere to stringent surface water quality standards for regulated constituents, most notably arsenic and antimony. Thus, coupled with the timing of water treatment needs with respect to the mining sequence and dewatering excess, treatment methods and capacity would be phased. During construction and early in operations, a modular, mobile, two-stage iron coprecipitation system would be utilized. Early in operations, this system would be replaced by a two-stage iron coprecipitation system located near the ore processing facility. Residuals (sludge) from the water treatment during construction would be stored in a small impoundment in the TSF footprint. During operations and closure, the residuals would be stored in the TSF. Due to contact water runoff seasonality, reuse, and equalization storage (i.e., ponds), average treatment rates are often significantly less than nominal treatment capacity, except during the Hangar Flats pit dewatering when a substantial proportion of treated water would be from relatively constant dewatering flows.

This is met with a staged water treatment strategy. The construction time period is paired with 300 gpm of peak capacity from package iron coprecipitation plants. The first three years of operations would require 1,000 gpm of total treatment capacity, using an iron coprecipitation plant that would remain until closure. During peak simultaneous dewatering of the Yellow Pine pit and the Hangar Flats pit, an additional 1,000 gpm of modular water treatment capacity would be brought online for approximately three years, then treatment capacity would be scaled back to 1,000 gpm for the remainder of operations and early closure.

At closure, the closure water treatment plant would be constructed to accommodate treatment of water from the TSF which would include iron coprecipitation and the application of reverse osmosis membrane treatment. After mine closure and final reclamation of the TSF Buttress and pit backfill surfaces, contact water treatment would no longer be required; but process water treatment for the TSF (Section 2.4.7.13) would continue longer, through approximately year 40. The closure treatment plant would be located on private land at the TSF Buttress as the TSF would ultimately be the only remaining water source requiring treatment.

Enhanced evaporation, using snowmaker style misters located over the lined TSF, collection ponds, and/or pits, would supplement the treatment system, in particular to prevent surplus process water accumulation in the TSF and eliminate contact water inventory, if necessary, when environmental conditions are conducive to evaporation.
2.4.5.11 **Sanitary Waste Handling Facilities**

Sanitary waste handling facilities would be present at SGP facilities and would be constructed and operated in accordance with Valley County, IDEQ, and Idaho Department of Health and Human Services standards. Sanitary wastewater would be treated using membrane bioreactor (MBR) or similar technology. Early in construction, the currently-permitted MBR plant at the existing exploration camp would be used, and treated effluent reused for flushing toilets and urinals (as allowed by Perpetua’s existing Reuse Permit M-228-02) or discharged to the existing drain field, while the worker housing facility and its associated treatment plant is under construction. During operations and closure, sanitary wastewater from the worker housing facility, ore processing facility, and administration buildings would be treated at a new MBR or similar plant and discharged to the East Fork SFSR via a permitted IDPES outfall. Vaults or portable toilets would be used at off-site facilities and remote locations on site (TSF, pits, maintenance facility etc.), and serviced as needed using vacuum trucks. Treatment residuals would be hauled off site to a permitted sanitary landfill. Vault/portable toilet wastewater would be hauled to the on-site sanitary wastewater treatment plant for treatment.

2.4.5.12 **On-site Composting Facilities and Solid Waste Collection and Disposal**

On-site composting facilities would be permitted by IDEQ with oversight by the local Health District. Small scale composting associated with organic materials generated at the worker housing facility may be incorporated within the centralized GMS in the Fiddle Valley. These composting facilities would be fenced. Any larger composting facilities deemed necessary to support growth media quality or quantity improvements would be located off site.

All construction and demolition waste generated at the SGP would be hauled off site for disposal at a permitted landfill; a landfill would not be constructed or maintained at the SGP. Solid waste from the worker housing facility, shops, and other work areas that cannot be composted or recycled would be collected in wildlife-resistant receptacles and hauled off site for disposal in a municipal waste landfill.

Material that meets the classification of a “hazardous waste” would be collected and stored, per the SGP Waste Management Plan at specially designed and operated secured satellite collection sites and a main storage site prior to shipment off-site to a Resource Conservation and Recovery Act (RCRA) certified hazardous waste disposal facility.

2.4.5.13 **Mine Site Borrow Sources**

Various types of earth and rock material would be used from borrow sources for construction, maintenance, closure, and reclamation activities. Most of these materials can be sourced at the SGP from existing development rock dumps, legacy spent heap leach ore, and from development rock removed as part of proposed surface mining and underground exploration activities. These materials would be subject to physical and chemical testing to determine suitability for use.
Native earth materials would be required for some applications. Specific areas within the SGP that have large quantities of high quality native alluvial and glacial granular borrow materials for use include:

- The alluvial and glacial soils in the Meadow Creek valley floor within the footprint of the TSF, TSF Buttress, Hangar Flats pit, and Yellow Pine pit;
- Sand, gravel, and cobbles in the lower Blowout Creek alluvial fan; and
- Glacial soils in the Fiddle Creek valley walls within the footprint of the Fiddle GMS.

### 2.4.5.14 Materials, Supplies, Chemical Reagents, and Wastes

Numerous materials, supplies, and chemical reagents would be used, including fuel, explosives, and ore processing reagents for the SGP. A SPCC Plan would be developed to establish procedures for responding to accidental spills and releases of petroleum products. In addition, a Hazardous Materials Handling and Emergency Response Plan would be developed to address procedures for responding to accidental spills or releases of hazardous materials to minimize health risks and environmental effects.

**Diesel Fuel, Gasoline, and Propane**

Aboveground storage tanks at the SGP would be used for fuels and other fluids, including gasoline, diesel fuel, lubricants, coolants, hydraulic fluids, and propane. Approximately 200,000 gallons of diesel fuel, 10,000 gallons of gasoline, and 30,000 gallons of propane would be stored at the SGP in addition to a variety of materials, supplies, and reagents (Table 2.4-11). Storage management would be outlined in the SPCC Plan. The storage tank facility for gasoline, diesel fuel, and propane would be located near the maintenance workshop with additional propane storage at the ore processing facility area, the underground portal area, and the worker housing facility.

**Explosives Storage**

Ammonium nitrate prill would be received in bulk in tanker trucks and transferred into storage silos. Other blasting supplies used for mine blasting operations would include blasting emulsion products, detonating cord, cast primers, and blasting caps. These products would be delivered in boxes or other approved containers on trucks. The explosives storage facility would include two silos containing ammonium nitrate on a concrete pad and two buildings, one for explosives and one for detonators. Components of bulk explosive material would be stored in separate and isolated containers, sized, and designed to meet Bureau of Alcohol, Tobacco, Firearms, and Explosives and MSHA requirements. The explosives storage facility would be fenced and securely gated. An explosives contractor would provide the products and manage the explosives storage facility.

**Miscellaneous Oils, Solvents, and Lubricants**

Various oils including motor oils, lubricants, antifreeze, and solvents would be shipped to the SGP on trucks. These would be stored in approved containers located within, or directly adjacent to, the maintenance shop and contained within secondary containments to prevent spills into the environment. All used petroleum products, waste antifreeze, and used solvents would be collected in approved containers, transported off site, and disposed or recycled.
**Miscellaneous Consumables**

Lime would be produced on site and stored in silos at the ore processing facility. Silos would be equipped with air emission controls. Sodium cyanide would be transported as dry cyanide briquettes to the SGP. Nitric and sulfuric acid would be transported in tanks designed to prevent spills even in the event of rollovers. Nitric and sulfuric acids would be stored in specialized non-corrosive, polyethylene-lined tanks located within the ore processing facility and would have secondary containment.

Miscellaneous consumables would consist of various reagents used in the ore processing facility, along with wear parts for the crushing and grinding circuits. Liquids would be shipped to the SGP in tank trucks designed for spill prevention and escorted to the SGP by pilot cars manned and equipped to handle spills. All reagents would be transported and stored in suitable containers in designated reagent storage areas.

**Waste Handling**

Wastes anticipated to be generated at the SGP include fluorescent bulbs, batteries, and empty aerosol containers which would be managed in accordance with the appropriate regulatory standards. Materials that are not consumed would be recycled, to the extent practical, or disposed of in accordance with applicable regulations.

Used petroleum products would be stored on site in approved containers that would be separate from other trash and garbage products. Used petroleum products would be transported off site for recycling or disposal in an approved facility.

Other legacy materials could be encountered during construction and operations. If encountered, these materials would be characterized to determine potential for re-processing, reuse, or on-site or off-site disposal.
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Units</th>
<th>Annual Use</th>
<th>Delivery Form</th>
<th>Typical Vehicle Payload</th>
<th>On-site Storage Capacity</th>
<th>Storage Method</th>
<th>On Site Mine Uses</th>
<th>Estimated Deliveries per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Fuel</td>
<td>Gallons</td>
<td>5,800,000</td>
<td>Bulk liquid</td>
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<td>5,000</td>
<td>10,000</td>
<td>Tanks</td>
<td>Mine Site</td>
<td>100</td>
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<tr>
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<td>1,000</td>
<td>Bulk liquid</td>
<td>200</td>
<td>1,000</td>
<td>Totes or Drums</td>
<td>Truck Shop</td>
<td>5</td>
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<tr>
<td>Tires</td>
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<td>246</td>
<td>Bulk solid</td>
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<td>Pallets</td>
<td>Variable</td>
<td>500 units</td>
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<td>Open Pits - blasting</td>
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<td>Storage Method</td>
<td>On Site Mine Uses</td>
<td>Estimated Deliveries per Year</td>
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<tr>
<td>-------------------------------------</td>
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<td>--------------------------</td>
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<tr>
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<tr>
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<td>LS primary crusher liners</td>
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<td>Tons</td>
<td>9.32</td>
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<td>LS Ball mill liners</td>
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<td>Sodium Cyanide</td>
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<td>4,000</td>
<td>Bulk containers</td>
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<td>300</td>
<td>Tanks, bins</td>
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<tr>
<td>Activated carbon</td>
<td>Tons</td>
<td>500</td>
<td>Super sack solid</td>
<td>22</td>
<td>100</td>
<td>Supersacks</td>
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</tr>
<tr>
<td>Copper sulfate</td>
<td>Tons</td>
<td>1,250</td>
<td>Supersacks, 1,000 kg</td>
<td>22</td>
<td>100</td>
<td>Supersacks</td>
<td>Mine Process Area</td>
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<tr>
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<td>Bulk Liquid</td>
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<td>22</td>
<td>50</td>
<td>Supersacks</td>
<td>Mine Process Area</td>
<td>14</td>
</tr>
<tr>
<td>Sodium metabisulfite</td>
<td>Tons</td>
<td>2,000</td>
<td>Supersacks</td>
<td>22</td>
<td>200</td>
<td>Supersacks</td>
<td>Mine Process Area</td>
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<td>Potassium amyl xanthate</td>
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<td>40</td>
<td>Stacked boxes</td>
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</tr>
<tr>
<td>Sodium hydroxide</td>
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<td>22</td>
<td>40</td>
<td>Supersacks</td>
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<td>3,000</td>
<td>6,000</td>
<td>Tanks</td>
<td>Mine Process Area</td>
<td>22</td>
</tr>
<tr>
<td>Common Name</td>
<td>Units</td>
<td>Annual Use</td>
<td>Delivery Form</td>
<td>Typical Vehicle Payload</td>
<td>On-site Storage Capacity</td>
<td>Storage Method</td>
<td>On Site Mine Uses</td>
<td>Estimated Deliveries per Year</td>
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<tr>
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<td>--------------------------</td>
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<td>-------------------------</td>
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</tr>
<tr>
<td>Scale control reagents</td>
<td>Pounds</td>
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<td>Drums or totes</td>
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<td>1,000</td>
<td>Drums or totes</td>
<td>Mine Process Area</td>
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<td>Sulfuric acid</td>
<td>Gallons</td>
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<td>Hydrogen peroxide</td>
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<td>7,100</td>
<td>ISO totes</td>
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<td>10,000</td>
<td>ISO totes</td>
<td>Mine Process Area</td>
<td>2</td>
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<tr>
<td>Sodium hypochlorite</td>
<td>Gallons</td>
<td>2,000</td>
<td>Totes</td>
<td>1,000</td>
<td>1,000</td>
<td>Totes</td>
<td>Water treatment</td>
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</tr>
<tr>
<td>Magnesium chloride, 33%</td>
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<tr>
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<td>Drums</td>
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<td>Lime</td>
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<td>-</td>
<td>7</td>
<td>Bags on pallets</td>
<td>Water treatment</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a
AP = AP 3477 is dialkyl dithiophosphate; a reagent used in the flotation circuit
BM = ball mill
ISO = International intermodal container that is manufactured according to the specifications outlined by the International Organization for Standardization (ISO)
kg = kilogram
LS = limestone
SAG = semi-autogenous grinding
2.4.5.15 Temporary Closure of Operations

No periods of temporary or seasonal closure are currently planned; however, a description of temporary closure is required for the SGP cyanidation permit if applicable. In the event of temporary suspension of mining activities, Perpetua would notify the Forest Service, USACE, IDEQ, IDWR, IDL, and Valley County in writing with as much advanced warning as possible of the temporary stop of mining activities. This notification would include reasons for the shutdown and the estimated timeframe for resuming production.

During any temporary shutdown, Perpetua would continue to implement operational and environmental maintenance and monitoring activities to meet permit stipulations and requirements for environmental protection. This would include the reclamation success monitoring.

Dewatering of the open pits may continue during temporary closure due to the negative effects that pit lake formation or highwall saturation would have on highwall stability and renewed mine operations. Since ore processing may not be occurring, excess water from the various facilities would need to be managed. The operational plans required by the Cyanidation Permit and other plans developed as part of IDEQ permits would also describe specific activities and provide details on how process water would be managed during a temporary closure.

A limited potential exists that unfinished facilities (such as haul roads, buttress, open pits, pit backfills, GMSs, etc.) would not have the same protective measures in place (e.g., stormwater collection systems or culverts) as would exist if the facility had been finished. Therefore, Perpetua would identify interim measures that would be taken to manage stormwater, sediment, dust, and other factors while the mining is temporarily stopped. Surface water diversion structures are all proposed to be installed prior to construction of the TSF, open pits, and the TSF Buttress; hence, surface water would be diverted around these facilities regardless of the stage of their completion.

Environmental reports would be submitted per previously agreed upon schedules. Regardless of the operating status of the mine, appropriate monitoring would continue until compliance with permanent regulatory closure requirements is attained, unless modified by the required regulatory authorities.

2.4.6 Surface and Underground Exploration

Surface and underground exploration including development drilling would occur to evaluate potential mineralized areas outside of the proposed mining areas. New surface and underground exploration activities would be conducted during construction and operations. Any additional future expansion of mining activities would require supplemental permitting and approvals, including additional evaluation under NEPA.

2.4.6.1 Surface Exploration

At any given time, disturbance associated with exploration activities conducted during construction and operations could include up to five acres of new temporary road disturbance and eight acres of drill pad disturbance on Forest lands at the SGP. Exploration sites would be reclaimed after completion of drilling. Disturbance resulting from surface exploration would total approximately 25 acres of roads and 40 acres of drill pads. Any jurisdictional stream crossings or impacts to jurisdictional wetlands could require
additional Section 404 CWA permits beyond those required for development and operation of the mine operations.

The exploration roads and drill sites would be located, as practical, on historical disturbance to avoid any identified cultural resources, other sensitive areas such as wetlands or Riparian Conservation Areas (RCAs), and potential impacts to habitat of ESA listed species. Figure 2.4-17 shows the boundary of the area within which ongoing surface exploration during construction and operations would occur.

Drill pad sizes would vary depending on the type of drilling equipment, number of holes to be drilled from the pad, and depth of drill hole. Drill pad sizes may range from approximately 0.05 to 0.15 acre.

Sumps and/or portable tanks would be used at each drill pad to collect drill cuttings and to manage and circulate drilling fluids. Sumps would be fenced and constructed with at least one side having a shallow grade for wildlife egress. Sumps would be backfilled and reclaimed when no longer needed for drilling.

Depending on the location of the drill pad, a variety of drill rigs and equipment would be supported by helicopter or terrestrial vehicle. Some drill holes may exceed 1,500 feet, but the average drill-hole depth would be approximately 800 feet. Drill holes would be both vertical and angled. Drilling activities also may include water exploration, dewatering well installation, and monitoring well installation. Water and non-toxic drilling fluids would be used for all drilling.

Dewatering and monitoring wells would be abandoned with surface completions/seals and be capped consistent with IDAPA 37.03.09 – Well Construction Standards Rules. Pre-collared holes would only be associated with track or truck mounted drilling equipment.

Areas disturbed for exploration would be contoured to blend into surrounding terrain; water bars and surface water channels would be retained to handle flows through the area. Compacted areas would be de-compacted as necessary prior to fertilizing and seeding.

Previously approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue as well.

2.4.6.2 Underground Exploration

Underground exploration activities could occur for the SGP throughout the life of the mine, such as the newly-discovered Scout Prospect, a 1-mile, downward-sloping tunnel (a decline). The decline would be used to reach the subsurface mineralized zone known as the Scout Prospect. The decline would be accessed from a portal facility known as the Scout Portal, located south of the planned ore processing facility (Figure 2.4-17). Approximately 100,000 tons of rock would be excavated from the decline. Exploration drill holes would be installed at various locations in the decline. Selected drill cuttings or core would be removed from underground for testing.

To construct the portal facility, the hillside would be cut into to develop a flat vertical slope using conventional underground drill and blast operations with mechanized equipment. Explosives would be used in the underground development process to construct the decline. The underground development
rock could be used for surface pad construction, hauled to the ore stockpile area, or hauled for storage in the TSF Buttress as appropriate.

Drilling is used in advance of the decline to ensure unexpected or unmanageable water pressures are not intersected. Water would be used in underground drilling or pumped from the collection point to the surface. Upon reaching the surface, this water would be piped to the ore processing facility to be used in the plant.

2.4.7 Closure and Reclamation

2.4.7.1 Overview

Closure and reclamation at the site would include interim, concurrent, and final closure and reclamation. Details on reclamation activities to be implemented for the SGP, including appropriate seed mixes to be used are described in the Reclamation and Closure Plan Stibnite Gold Project (Tetra Tech 2021a). Interim reclamation is intended to provide shorter-term stabilization to prevent erosion of disturbed areas and stockpiles that would be more fully and permanently reclaimed later.

Concurrent reclamation is designed to provide permanent, low-maintenance achievement of final reclamation goals on completed portions of the site prior to the overall completion of mining activities throughout the SGP. Approximately 37 percent of the reclamation would be completed concurrent to mining and ore processing; remaining reclamation activities would be completed during closure.

Final closure and reclamation would involve removing all structures and facilities; reclamation of those areas that have not been concurrently reclaimed such as the TSF and some backfill surfaces; recontouring and improving drainages; creation of wetlands; reconstructing various stream channels; decommissioning of the East Fork SFSR diversion tunnel; growth media placement; planting and revegetation on disturbance areas; and reopening Stibnite Road (FR 50-412) through the SGP.

Final reclamation of certain facilities could continue beyond the five-year closure and reclamation period. The Burntlog Route would be needed until the TSF is fully reclaimed, after which the newly constructed portions of the road would be decommissioned and reclaimed, and the currently existing portions of the road would be returned to their prior use.

Surface water flow diversion of portions of the East Fork SFSR, Garnet Creek, Meadow Creek, Midnight Creek, and Hennessy Creek would be reclaimed and incorporated into constructed wetlands (i.e., Garnet Creek) or restored stream channels across the reclaimed TSF (i.e., Meadow Creek) or Yellow Pine pit backfill.

Closure and reclamation activities would be intended to achieve post-mining land uses of wildlife and fisheries habitat and dispersed recreation at the SGP. Dispersed recreation uses would be accessible by the reopening of Stibnite Road (FR 50412) through the backfilled Yellow Pine pit that would facilitate recreational traffic and access to Thunder Mountain. The proposed final reclaimed condition of the site is shown on Figure 2.4-18. Concurrent and final closure and reclamation for the SGP are described in greater detail in the following sections.
Figure 2.4-17
Surface Exploration Boundary
Stibnite Gold Project
Stibnite, ID
Data Sources: Perpetua 2021a
Figure 2.4-18
Post Closure and Reclamation Condition
Stibnite Gold Project
Stibnite, ID
Data Sources: Perpetua 2021a
Closure and reclamation activities would be intended to achieve post-mining land uses of wildlife and fisheries habitat and dispersed recreation at the SGP. Dispersed recreation uses would be accessible by the reopening of Stibnite Road (FR 50412) through the backfilled Yellow Pine pit that would facilitate recreational traffic and access to Thunder Mountain. The proposed final reclaimed condition of the site is shown on Figure 2.4-18. Concurrent and final closure and reclamation for the SGP are described in greater detail in the following sections.

ASAOC activities as described under the No Action Alternative would occur concurrent with 2021 MMP activities.

2.4.7.2 Decommissioning, Demolition, and Disposal of Facilities

Perpetua would dismantle or demolish structures and facilities not necessary for post-closure water management (e.g., certain culverts and pipelines). The materials from the dismantling or demolition of structures and facilities would be salvaged or disposed of in permitted off-site landfills. All reagents, petroleum products, solvents, and other hazardous or toxic materials would be removed from the site for reuse or would be disposed of according to applicable state and federal regulations. Concrete foundations would be broken or fractured as required to prevent excessive water retention and covered in-place with a minimum of 2 feet of a combination of 1.5 feet of backfill and 0.5 feet growth media or would be broken up and buried in the TSF Buttress or pit backfill prior to installation of a geosynthetic liner cover.

Soil/rock beneath fuel storage areas and chemical storage buildings would be tested for contamination and removed or disposed of appropriately if needed.

2.4.7.3 Underground Exploration and East Fork SFSR Tunnel

Perpetua would decommission and close underground facilities and underground support facilities, including the portals of the East Fork SFSR tunnel and Scout decline. To prevent future access to underground workings, the underground portals (i.e., East Fork SFSR tunnel and Scout decline) would be closed using concrete block bulkheads, rockfills, or a combination of rockfill and low-permeability foam. The downstream (north) East Fork SFSR portal and the Scout decline would be closed with bulkheads inside the portals (where overhead cover was at least 3 times the tunnel height) or backfilled with clean rockfill starting inside the portals and working outward, and up against the portal headwalls. Surface swales would be installed to direct surface water around the backfilled portal, and the exterior backfill, and surrounding disturbance would be graded to blend with adjacent topography, covered with growth media, and revegetated. At the East Fork SFSR upstream (south) portal, the control weir would be left in place, and the fishway weir notch raised with concrete, creating an approximately 4-foot-high sill to exclude river water or alluvial groundwater, and low-permeability geofoam or similar would be installed inside the portal after the initial backfill or bulkhead, to prevent water entry. Then, the portal area would be filled, regraded, and revegetated as described for the other openings.
2.4.7.4 Yellow Pine Pit

The majority of the Yellow Pine pit backfill material (90 percent) would be West End pit development rock. The balance of Yellow Pine pit backfill would include development rock from the Hangars Flat pit (5 percent) and the Yellow Pine pit (5 percent). Backfill would be placed in lifts not exceeding 100 feet in vertical height with the large equipment, to include selective placement of the top lifts by direct dumping to better control the type of rock that would be placed near the surface. This placement method also would limit subsidence of the backfill and the amount of regrading necessary prior to placement of growth media. This material would not be compacted beyond that which occurs during placement, subsequent routing of trucks, burial, and consolidation. Portions of the highwalls on the east and west sides of the pit would remain above the backfilled portion of the pit and would not be reclaimed. A sinuous channel would be constructed through the backfilled area for the reconstructed East Fork SFSR with an average valley gradient approximating the historical, pre-disturbance river gradient (Tetra Tech 2021b). A low permeability geosynthetic liner would be incorporated into the cover over the entire surface of the backfilled Yellow Pine pit, including the re-constructed channel floodplain corridor to reduce the infiltration of meteoric water into backfill material, which could dewater the restored stream channel and result in additional metal leaching from the underlying backfill. Above the geosynthetic liner in the stream corridor, a layer of relatively fine material would be placed to protect the stream liner from puncture, followed by coarse rock armor to protect from exposure via stream scour, followed by floodplain alluvium at a minimum thickness equal to the maximum estimated scour depth of the proposed stream channel. Growth media would then be placed and the area revegetated. The lined corridor would be wide enough to accommodate future channel migration, evolution, and over-bank flooding. The cover system outside the stream/floodplain corridor would be similar to that described for the TSF Buttress (Section 2.4.7.6). Portions of Hennessy and Midnight Creeks would be restored over the backfilled area along with the reconstructed East Fork SFSR.

Hennessy Creek would cascade over the approximately 275 feet tall west highwall of the Yellow Pine pit to a restored section of low-gradient channel on the western edge of the reconstructed East Fork SFSR floodplain before joining the restored East Fork SFSR channel. Midnight Creek would be restored across the southeastern portion of the reconstructed East Fork SFSR floodplain. After closure of the East Fork SFSR tunnel, backfilling of the Yellow Pine pit, and restoration of the East Fork SFSR and Hennessy Creek across the backfill, the Hennessy Creek diversion would be decommissioned and the area reclaimed, along with the adjacent operations-phase public access road.

To accommodate migrating fish, including Chinook salmon and bull trout, step pools would be established within the constructed East Fork SFSR channel. The vertical relief (drop) between successive pools would not exceed published fish passage criteria. Detailed hydrologic and hydraulic analyses would inform the overall channel and floodplain design and construction, with channel bankfull width approximately 25 to 30 feet, and average depth of approximately 2 feet. The lined Stibnite Lake, of similar size to the existing Yellow Pine pit lake, would be constructed within the lined corridor.

Access through the site to Thunder Mountain Road (FR 50375) would be reestablished with construction of an access road through the backfilled area, replacing the segments of the Stibnite Road (FR 50412) that were removed by mining.
2.4.7.5 West End Pit

West End Creek would be routed into the West End pit in a rock chute on the highwall adjacent to the upper legacy development rock dump, below which a pit lake would form in the main portion of the West End pit. The West End pit lake would fill gradually up to 400-feet-deep, and lake levels would fluctuate seasonally and with longer-term climate variations; however, the lake would not be expected to completely fill with water or spill due to the limited catchment area.

To account for model uncertainty, lake levels would be monitored after closure, as specified in the Environmental Monitoring and Management Plan (EMMP), and a threshold water level would be established, sufficient to contain the predicted runoff volume from a high-snowpack year without discharge. If water levels approach the threshold, either or both surface water diversion and water treatment could be implemented to prevent the lake from spilling. If needed, a temporary treatment unit would be mobilized to the site to treat and discharge the pit lake water until the lake level falls below the threshold discharge level, thus preventing untreated discharge in potential subsequent wet weather years and enabling gradual and predictable water treatment rather than treatment at higher but variable and uncertain peak spring runoff rates.

The Midnight pit, the approximately 6-acre, 100-foot-deep southeastern portion of the overall West End pit within the Midnight Creek catchment, would be backfilled during operations with approximately 6 million tons of development rock from the West End pit. The backfill would be placed to achieve a mounded final reclamation surface to promote drainage away from the West End pit and prevent formation of a pit lake within Midnight pit. Portions of the backfill would be covered with growth media and revegetated, and the remainder covered with talus like development rock to mimic a natural talus slope.

The floor of the sidehill pit southwest of the main West End pit would be graded to drain, covered with growth media, and revegetated. No backfilling would occur for the main West End pit. At closure, the remaining road into the pit and access to highwalls would be blocked with large boulders and/or earthen berms to deter motorized vehicle passage into the pit.

2.4.7.6 Tailings Storage Facility and TSF Buttress

Perpetua proposes to complete tailings reclamation approximately 9 years after ore processing operations cease. After tailings consolidate sufficiently to use heavy equipment on top of the tailings, starting approximately 3 to 5 years after the end of deposition, Perpetua would begin with placement of cover material, then construct wetlands and restore Meadow Creek and its tributaries within appropriately sized lined floodplain corridors, place growth media, and revegetate the area.

Once ore processing operations have ceased, Perpetua would begin removing the remaining supernatant water pool and ongoing accumulation of meteoric water and consolidation water through a combination of spray evaporators (similar to snowmaking misters) operated within the TSF boundary and an active water treatment that meets IPDES discharge limits, followed by discharge to the East Fork SFSR or Meadow Creek. Removal of the remaining supernatant water from the TSF would allow the surficial layers of the tailings to dry and gain strength, which would allow equipment to operate on the tailings surface for grading and the placement of the geosynthetic liner, overlain by unconsolidated overburden
and growth media. Concave areas in the consolidated tailings surface would be filled to create suitable drainage conditions prior to liner and cover installation in the area designed to become restored stream channel. Cover placement and minor grading of tailings would occur, beginning within 3 to 5 years from the end of deposition, as portions of the TSF surface dry enough to allow equipment traffic, working inward from the facility perimeter. The cover material overlying the geosynthetic liner would be sourced from unconsolidated overburden or other appropriate material stored in a GMS on top of the adjacent TSF Buttress.

Perpetua would restore appropriately designed meandering stream channels (Meadow Creek and tributaries) within a stream and floodplain corridor across the top of the lined TSF surface (Rio Applied Science and Engineering [Rio ASE] 2021). Pools and riffles would be constructed within the channel. Measures to create aquatic habitat would include side channels, oxbows, boulder clusters, root wads, and large woody debris. This would allow for the post-closure development of riparian habitat, convey water off the facility, and minimize potential interaction of surface water with the underlying tailings. Given the nature of the surface of the TSF, the constructed channel would have a shallow gradient.

Detailed hydrologic and hydraulic analyses would inform the overall channel and floodplain design, which would necessitate the construction of defined channels ranging from approximately 5 to 15 feet in bankfull width, with average bankfull depth reaching approximately 2 feet. A connected floodplain up to 200 feet wide would convey higher flows during a 100-year flood event.

Consolidation of the tailings would continue after cover placement and surface reclamation, at gradually declining rates, until approximately Mine Year 40. To prevent tailings consolidation water from mixing with surface water on the cover, potentially leading to water quality impacts if discharged to streams, the consolidation water would be collected for treatment, using shallow wells and gravel or geosynthetic drains. Initially, collected flows would be routed to a water treatment plant (WTP) for treatment and discharge. Treatment would no longer be required after approximately Mine Year 40, at which time the treatment facility would be decommissioned and the WTP site reclaimed.

Final slopes of the TSF Buttress would be variable, to blend with the surrounding terrain to the extent practicable, produce a permanent and stable landform, provide access for future maintenance on the TSF and buttress, and provide for non-erosive drainage across the reclaimed face of the buttress. Upon completion of final grading of the TSF Buttress, a low permeability geosynthetic cover would be placed over the facility, which would be designed to limit infiltration through the underlying development rock. The geosynthetic liner would be overlain by an inert soil/rock layer (non-potentially acid generating [PAG]/metal leaching development rock, fill, or alluvium) and growth media and revegetated. Similar to that for the TSF, a channel and floodplain corridor would be established for Meadow Creek across the top of the lined buttress. The channel would have a low gradient and wide floodplain across the top of the buttress, then drop more steeply to the valley floor near the south abutment. The steep channel segment would consist of a boulder chute that would flow through multiple energy-dissipating basins (one mid-slope and one at the toe of the TSF Buttress) before being discharged to a restored Meadow Creek on the valley bottom.
2.4.7.7 Hangar Flats Pit

Hangar Flats pit would be backfilled up to the valley bottom elevation or slightly higher and no pit lake is anticipated. The already-established Meadow Creek diversion channel and floodplain corridor would be retained around Hangar Flats pit as the final configuration, and the segment of Meadow Creek between the toe of the TSF Buttress and the entrance to the Hangar Flats pit diversion would be restored along with adjacent riparian wetlands. At closure, the entire surface of the backfilled Hangar Flats pit would be covered with a low permeability geosynthetic liner overlain with seed bank material to establish wetlands. Non-perennial drainages in adjacent upland areas would be routed to facilitate development of the wetland hydrology. Meadow Creek downstream of the Hangar Flats pit diversion, to the confluence with the East Fork SFSR, would be enhanced during mine operations with large woody debris, boulder cluster habitat structures, and riparian plantings.

2.4.7.8 Transmission Line and Electrical Infrastructure

The Johnson Creek and Stibnite substations would not be decommissioned immediately during mine closure; the transmission line between these substations would remain to provide power for post-closure water treatment. Once there is no longer a need for active water treatment, Perpetua, in coordination with IPCo, would disassemble the approximately 9-mile transmission line between the Johnson Creek and Stibnite substations. The substations, switchgear, and power line would be removed. The transmission line ROW and associated access roads would be recontoured to match surrounding topography and revegetated. As part of revegetation, the transmission line structure pads and access roads would be scarified and revegetated. Revegetation would not be required on affected lands, or portions thereof, where planting is not practicable or reasonable because the soil is composed of excessive amounts of sand, gravel, shale, stone, or other material to such an extent to prohibit plant growth (IDAPA 20.02.02).

2.4.7.9 Burntlog Route

Once all final mine closure/reclamation work has been completed, Perpetua would reduce the 21-foot-wide travel way of 19.8 miles of Burntlog Road (FR 447), 1.3 miles of Meadow Creek Lookout Road (FR 51290), and 2 miles along Thunder Mountain Road (FR 375) of the Burntlog Route to their approximate pre-mining width. Returning this 23 miles of existing road to pre-mining condition would entail grading and/or scarification along the outside edges of the road followed by seeding with the species listed in the Reclamation and Closure Plan (Tetra Tech 2021a) or as approved by the Forest Service. Perpetua would remove ditches, cross drains, culverts, safety berms, mile markers, guardrails, and signs on roads if these features are no longer needed. These roads would retain the flatter grades and gentler curves constructed for mine operations.

The approximately 15 miles of Burntlog Route that was newly constructed for the SGP, connecting Burnt Log Road (FR 447) to Meadow Creek Lookout Road (FR 51290) and Thunder Mountain Road (FR 50375) would be fully decommissioned. The road would be decommissioned by pulling back and recontouring road cuts to slopes that are similar to, but not necessarily matching, pre-project conditions, and that would be consistent with the surrounding terrain as practicable. Surface water diversions, cross drains, culverts, safety berms, mile markers, guardrails, and signs would be removed. Soil nail walls, constructed of anchors bolted into the ground with a sprayed concrete surface, would remain to support slopes in areas with soft soils or weathered rock. Water bars or other erosion and sediment control
structures, armored stream crossings, and stormwater crossings would be included where necessary. The
reclaimed areas would be scarified, and 6 inches of growth media would be placed in upland areas,
followed by seeding and certified weed-free mulching on slopes over 30 percent. Revegetation would not
be required where planting is not practicable or reasonable due to excessive amounts of sand, gravel,
shale, stone, or other material to such an extent to prohibit plant growth (IDAPA 20.02.02).

2.4.7.10 Post Closure Public Access

As mentioned in Section 2.4.7.4, a service road would be established over the backfilled Yellow Pine pit
to allow public access through the reclaimed site and connect Stibnite Road (FR 50412) to Thunder
Mountain Road (FR 50375) (Figure 2.4-18).

2.4.7.11 Off-site Facilities

Following mine closure and reclamation, the Burntlog Maintenance Facility buildings would be removed.
The sewer system and septic tanks for the Burntlog Maintenance Facility would be decommissioned. All
reagents, petroleum products, solvents, and other hazardous or toxic materials would be removed from the
site and disposed of according to applicable state and federal regulations. Soil/rock beneath fuel storage
areas and chemical storage buildings would be tested for contamination and treated if necessary. After
demolition of the buildings and facilities, the site would be graded, and drainage restored.

Perpetua has identified a “light industry” post-mining land use for the SGLF in which the facility could be
maintained by a third party for future use, meaning the facility, located on private land, would not be
reclaimed. A new conditional use permit (CUP) from Valley County would be required prior to use by
any other entity. If there is no further use of the site after a two-year period, the structures would be
removed and the site reclaimed (Valley County CUP No. 20-12 Stibnite Gold Project - Logistics Facility).

2.4.7.12 Contouring, Grading, Growth Medium Placement, and Seeding

Except for the Hangar Flats pit highwall above the valley bottom, the West End pit, and a portion of the
Yellow Pine pit highwall, Perpetua would contour and grade disturbed areas to blend into the surrounding
topography and terrain. Compacted areas such as roads, ore stockpile areas, parking lots, fuel storage
areas, and building sites would be prepared prior to placement of growth media and revegetation. Haul
routes and access roads would be re-contoured to establish natural drainage patterns.

Growth media suitability criteria include USDA texture, percentage of organic matter, course fragment
percentage and acidity (pH). Root zone material suitability guidelines include USDA texture, course
fragment percentage, soil acidity (pH), electroconductivity, sodium adsorption ratio, Net Acid Generation
(NAG) pH, bulk density and arsenic, antimony, and mercury levels. Perpetua would manufacture growth
media material using screened fines from glacial till sources, available mulched vegetation, and off-site
composted material from private lands. Off-site sources for composting feedstock materials would be in
compliance with Forest Service requirements.

Planting, seeding, and mulching would be conducted in the fall and early winter to take advantage of
snowpack and springtime moisture. Where cover crops are used in lieu of mulch, seeding would occur in
the spring or fall followed by seeding of the permanent mixture. The forbs, grass species, seed amounts,
and the trees and shrubs planned for planting on reclaimed areas are described in Tetra Tech (2021a) and would be approved by the Forest Service.

2.4.7.13 Post Closure Water Treatment

Evaluation of post-closure water treatment is ongoing. For the 2021 MMP, Perpetua has indicated that sources of water that could require treatment during closure and reclamation and through the post-closure period include TSF runoff and tailings consolidation water, plus any TSF Buttress toe seepage.

As previously described, consolidation water would be withdrawn from beneath the TSF geosynthetic cover using a combination of wells, wicks, and/or gravel drains, and routed to water treatment. Collected flows would be routed to the water treatment plant for treatment and discharge. Once it is determined that treatment is no longer required based upon agency approvals, the treatment facility would be decommissioned and the WTP site reclaimed. Water treatment would be provided during the reclamation and closure and post-closure phases until waters requiring treatment are no longer being generated. Life-of-mine water treatment of the TSF and other facilities is discussed in Section 2.4.5.10.

As described in Section 2.4.7.5, if spillage of surface water from the West End pit lake becomes imminent, a portable system would be brought to the site to treat and discharge pit lake water to maintain levels below the rim of the lake and prevent uncontrolled release of lake water.

2.4.7.14 Closure and Reclamation Financial Assurance

As part of the approval for the SGP, Perpetua would be required to post financial assurance to ensure that NFS lands and resources involved with the mine operations are reclaimed in accordance with the approved plan of operations and reclamation requirements (36 CFR 228.8 and 228.13). This financial assurance would provide adequate funding to allow the Forest Service to complete reclamation and post-closure operation, including continuation of any post-closure water treatment, maintenance activities, and necessary monitoring for as long as required to return the site to a stable and acceptable condition in the event Perpetua was unable to do so. The amount of financial assurance would be determined in collaboration with the Forest Service and would “address all Forest Service costs that would be incurred in taking over operations because of operator default” (Forest Service 2004). The financial assurance would be required in a readily available bond or other instrument payable to the Forest Service. To ensure the bond can be adjusted as needed to reflect actual costs and inflation, there would be provisions allowing for periodic adjustments in the final plan of operations prior to approval. Calculation of the initial bond amount would be completed following the Record of Decision (ROD) when enough information is available to adequately and accurately perform the calculation. In addition to the Forest Service-required bond, mitigation under Section 404 of the CWA also requires financial assurance.

The IDL would require a bond as part of their permitting authority and IDEQ would require a bond for the cyanidation permit which would then be held by IDL. The IDWR is the state agency responsible for design review and approval of the TSF. IDWR also would require a bond so that the TSF can be placed in a safe maintenance-free condition if abandoned by the owner.
2.4.7.15 Closure and Reclamation Traffic

Most closure and reclamation traffic would occur May through November. Mine traffic during closure and reclamation is anticipated to result in a total AADT of 27, with 15 being from heavy vehicles and 12 being from light vehicles.

2.4.8 Monitoring

Air emissions, groundwater, surface water, aquatic, and other environmental parameters would be monitored during mine construction, operation, closure, and post-closure as described and specified in the EMMP (Brown and Caldwell 2021c). Authorizations from federal and state agencies include monitoring requirements for resources (e.g., air emissions, surface water, and groundwater) during mine construction, operation, closure and reclamation, and post-closure. Mitigation measures and monitoring actions would not be known fully until required permits have been issued.

Monitoring would be conducted following the completion of closure and reclamation of all facilities and disturbance areas to demonstrate compliance with permit requirements and to measure the success of reclamation and mitigation. Final monitoring requirements and timelines would be outlined in the final permit approval documents and the final EMMP.

The final EMMP would consist of multiple component plans, each of which would be finalized upon issuance of the related permit(s) and would contain monitoring and management requirements from each permit. In some cases, if environmental outcomes may be uncertain, the EMMP could include adaptive management planning which requires identification of performance measures, impact thresholds, and operational adjustment options, all intended to achieve and demonstrate compliance with applicable permitting and/or consistency with the environmental analysis.

2.4.8.1 Environmental Monitoring

The EMMP (Brown and Caldwell 2021c) provides an overview of the actual or anticipated monitoring and/or management requirements for each of the required regulatory permits and establishes Perpetua’s commitments to environmental monitoring and management of mine facilities and environmental resources. The EMMP would allow Perpetua to monitor its operations and environmental commitments, document permit compliance, and reduce potential impacts to environmental resources. The EMMP describes the component monitoring and management plans that would be developed and used by Perpetua to manage water resources, monitor mine facilities, and monitor environmental and cultural resources. The EMMP includes environmental tasks and lists environmental permits, licenses, authorizations, and corresponding obligations.

2.4.8.2 Reclamation Monitoring

Prior to reclamation monitoring and maintenance programs, the Forest Service and IDL would agree to specific quantitative and qualitative reclamation monitoring plans and standards.

Reclamation monitoring would begin during concurrent reclamation at SGP facilities. Quantitative and qualitative monitoring of reclamation success would begin the first growing season after concurrent or final reclamation is completed and would continue until success criteria are satisfied. The Reclamation
and Closure Plan (Tetra Tech 2021a) presents the quantitative and qualitative reclamation monitoring that would be conducted and the performance standards that would be used (with Forest Service and IDL approval) to determine when maintenance activities are necessary, or reclamation is complete. These monitoring requirements are summarized below.

Erosion and Sediment Control Monitoring

Soil stability would be estimated for all reclaimed areas using qualitative descriptors. A reclamation specialist would observe each reclaimed area and assign qualitative descriptors. The observations would be completed twice annually for erosion control purposes, once in the spring and once in the fall; and after three years for performance monitoring purposes. For performance monitoring, the observations would be made at the same time the vegetation success observations are made. The monitoring results would be used to aid in determining the cause of any failures that are encountered and to locate problem areas before erosion becomes widespread enough to affect reclamation success.

Slope Stability Monitoring

Slope stability would be monitored during the erosion observations. Qualified staff would look for signs of slope movement, cut slope and rock face failures, and other indications of slope instability. The location and dimensions of significant surface cracks and fill slope bulges would be monitored. This information would be used to determine if surface cracks are the result of differential settling of fill material or slope instability. The appropriate regulatory agency would be notified, and corrective plans would be developed.

Reclamation Maintenance Procedures

If the performance of reclaimed areas is not satisfactory, appropriate maintenance activities would be implemented. Maintenance activities may include one or more of the following:

- Sediment removal from sediment basins, stormwater drainage channels, and diversions as necessary to maintain their design capacity;
- Diverting surface water away from reclaimed areas where erosion jeopardizes attainment of reclamation standards;
- Stabilizing rills, gullies, and other erosion features or slope failures that have exposed development rock;
- Noxious weed and invasive plant species control; and
- Re-seeding or re-applying reclamation treatments in areas where it is determined through monitoring and agency consultation that reclamation would not meet standards.

Annual Report

Perpetua would submit an annual report to the Forest Service and the other federal and state agencies that are responsible for issuing authorizations applicable to reclamation for the preceding calendar year. The annual report would contain descriptions of the reclamation activities completed during the previous year,
a summary of areas reclaimed, a discussion of the results of the reclamation monitoring conducted, and corrective actions implemented.

## 2.4.9 Environmental Design Features

The SGP must comply with all laws and regulations that apply to the proposed activities (Table 2.4-12). Standards and guidelines in the Boise Forest Plan and Payette Forest Plan (Forest Service 2003a, 2010a) that are designed to reduce or prevent undesirable impacts resulting from proposed management activities are incorporated into the action alternatives by reference. In addition, best management practices outlined in the Best Management Practices for Mining in Idaho (IDL 1992) would be implemented where appropriate and applicable for operations to minimize site disturbance from mining and drilling activities.

In the design of the 2021 MMP, Perpetua has already considered many of the potential environmental impacts that might be caused by the SGP. This has led to an internal evaluation of project design features and operational characteristics that may have the effect of reducing and/or eliminating potential environmental impacts of the SGP. Such project-specific measures intended by a proponent to inherently reduce and/or avoid potential environmental impacts of a proposed action are referred to as environmental "design features".

Based on the application of permits and regulatory compliance requirements to the project, regulatory requirements, standards and guidelines, best management practices, and likely permit conditions are listed in Table 2.4-12. The environmental design features (EDFs) beyond regulatory requirements that have been proposed and committed to by Perpetua are listed in Table 2.4-13. The impact analysis and environmental consequences takes these EDFs as well as regulatory requirements into consideration, such that the identified potential impacts of the SGP would be those that remain after their application. These EDFs and regulatory requirements would be applied to reduce and minimize impacts to resources from the SGP.

### Table 2.4-12 Prominent Regulatory and Forest Plan Requirements

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Reference</th>
<th>Resources Affected</th>
</tr>
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<tbody>
<tr>
<td>The Proponent will prepare a dust mitigation plan with appropriate schedule or triggers for control deemed adequate by IDEQ to achieve the level of control of 93 percent of dust (as submitted in the proponent’s draft application for Permit to Construct from IDEQ). Alternatively, the proponent could employ particulate matter or opacity monitors deemed adequate by IDEQ and the Forest Service and immediately apply water or chemical dust control when PM or opacity monitors reach levels within 10 percent of the threshold determined by IDEQ.</td>
<td>IDEQ Permit</td>
<td>IDEQ Permit to Construct</td>
<td>Air Quality, Wildlife, Vegetation, Wilderness</td>
</tr>
<tr>
<td>During project planning, affected tribe(s) shall be consulted regarding opportunities for restoration, enhancement, and maintenance of native plant communities that are of interest to tribe(s) when proposed activities may affect those plant communities.</td>
<td>FP Component</td>
<td>BNF and PNF: TRST04</td>
<td>Cultural Resources, Vegetation</td>
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<tr>
<td>Description</td>
<td>Type</td>
<td>Reference</td>
<td>Resources Affected</td>
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<td>When taking water from fish-bearing waters for road and facility construction and maintenance activities, intake hoses shall be screened with the most appropriate mesh size (generally 3/32 of an inch), or as determined through coordination with National Oceanic and Atmospheric Administration Fisheries and/or USFWS.</td>
<td>FP Component</td>
<td>BNF and PNF: FRST01 TEST32</td>
<td>Fish</td>
</tr>
<tr>
<td>Fish passage shall be provided at all proposed and reconstructed stream crossings of existing and potential fish-bearing streams.</td>
<td>FP Component</td>
<td>BNF and PNF: SWST08</td>
<td>Fish</td>
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<td>Surface water withdrawal intake hoses would be situated so as to prevent generation of turbidity in bottom sediments during pumping.</td>
<td>Design Feature</td>
<td>BNF and PNF: SWST08</td>
<td>Fish, Water Resources</td>
</tr>
<tr>
<td>Where settlement ponds, tailing dams, or impoundments are planned, each would be located, designed, constructed, and inspected under the supervision of a professional engineer.</td>
<td>FP Component</td>
<td>BNF and PNF: MIGU03</td>
<td>Geology and Geotechnical</td>
</tr>
<tr>
<td>Prohibit solid and sanitary waste facilities in RCAs. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RCAs exists, then: Analyze waste material using the best conventional methods and analytic techniques to determine its chemical and physical stability characteristics. Locate and design waste facilities using the best conventional geochemical and geotechnical predictive tools to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, and such releases or instability would result in exceedance of established water quality standards or would degrade surface resources, prohibit such facilities in RCAs. Monitor waste and waste facilities to confirm predictions of chemical and physical stability and make adjustments to operations as needed to avoid degrading effects to beneficial uses and native and desired non-native fish and their habitats. Reclaim and monitor waste facilities to ensure chemical and physical stability and revegetation to avoid degrading effects to beneficial uses and native and desired non-native fish and their habitats. Require reclamation bonds adequate to ensure long-term chemical and physical stability and successful revegetation of mine waste facilities.</td>
<td>FP Component</td>
<td>BNF and PNF: MIST09</td>
<td>Geology and Geotechnical, Wetlands and Water Resources, Wildlife, Fish</td>
</tr>
<tr>
<td>Transport hazardous materials on the Forest in accordance with 49 CFR 171 in order to reduce the risk of spills of toxic materials and fuels during transport through RCAs.</td>
<td>FP Component</td>
<td>BNF and PNF: SWGU11</td>
<td>Hazardous Materials, Fish, Health and Safety</td>
</tr>
<tr>
<td>A SPCC shall be prepared in accordance with 49 CFR parts 171 through 180, including packaging, transportation, incident reporting, and incident response. Include the following items within the SPCC Plan:</td>
<td>Regulatory Requirement and Design Features</td>
<td>49 CFR 171</td>
<td>Hazardous Materials, Health and Safety, Water Resources,</td>
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<td>During off-loading of fuel from fuel vehicles or during refueling operations have a standard marine-type fuel containment boom (which would be of sufficient length for a worst-case discharge), spill prevention kit, and fire kit readily available on site. Store two or more spill containment/response caches along each of the fuel delivery routes. Spill response team will carry sufficient containment equipment for one full fuel tanker. Include the Forest Service as a party to be notified in the event of a hazardous materials spill. Intake pumps, engines, fuel storage, fuel containment site, and other equipment with fuel or lubricants would be inspected at each refueling and periodically between refueling for leakage or spillage. Pilot and emergency spill response vehicles would carry appropriate containment and first aid equipment. All fuel containers would be marked with contents, owner’s name and contact information. Material Safety and Data Sheets for all products would be posted and available on site with the SPCC plan. Intake pumps would not be situated within the active stream/ditch channel and would be placed within containment vessels capable of holding 120 percent of the pump engine’s fuel, engine oil and hydraulic fluid. The smallest practical pump and intake hose would be used. Following large storm events, the intake pumps would be inspected to determine if stream flow has encroached into the pump area and if the pump needs to be moved so it remains above flowing water. A spill prevention and clean-up kit would be placed at the intake pump site and would consist of absorbent pads and/or boom (which would be sufficient length for a worst-case discharge), drip pan, a shovel, and a fire extinguisher. Spare fuel for the water intake pump would be stored in approved [29 CFR 1926.152(a)(1)] fuel storage containers placed into a secondary containment vessel capable of holding at least 120 percent of the volume of the fuel in the fuel container. A copy of the SPCC plan would be kept at an appropriate on-site facility. Unless otherwise authorized, all garbage or refuse should be removed from NFS lands. This includes, but is not limited to, empty fuel and lubricant containers. Food and garbage would be stored either indoors, in vehicles, or if outside, in wildlife-proof containers. No garbage would be burned.</td>
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<tr>
<td>The operator shall comply with all applicable Federal and State fire laws and regulations and shall take all reasonable measures to prevent and suppress fires on the area of operations and shall require their employees, contractors and subcontractors to do likewise.</td>
<td>Regulatory Requirement</td>
<td>36 CFR 228.11</td>
<td>Health and Safety, Vegetation</td>
</tr>
<tr>
<td>The operator shall comply with State of Idaho fire protection procedures (as outlined in IDAPA 20.04.01) and any local Valley County Fire District regulations and shall require their employees, contractors and subcontractors to do likewise.</td>
<td>Regulatory Requirement</td>
<td>IDAPA 20.04.01</td>
<td>Health and Safety, Vegetation</td>
</tr>
<tr>
<td>Several fire-response kits would be spaced strategically around the project area and be inspected annually.</td>
<td>Design Feature</td>
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<td>Health and Safety, Vegetation</td>
</tr>
<tr>
<td>On-site staff will maintain contact with Krassel District Ranger to ensure appropriate procedures are followed in the event of implementation of fire restrictions or woodland use restrictions (e.g., “Red Flag Warnings”).</td>
<td>Design Feature</td>
<td></td>
<td>Health and Safety, Vegetation</td>
</tr>
<tr>
<td>Damage to or loss of Forest System trails from mining activities should be repaired or mitigated by the appropriate party.</td>
<td>FP Component</td>
<td>BNF: REGU22, REGU24, PNF: REGU23, REGU26</td>
<td>Recreation</td>
</tr>
<tr>
<td>Architectural designs would follow principles and concepts outlined in the Built Environment Image Guide. Facilities identified as necessary should blend with the surrounding landscape character and the ROS setting. ROS descriptions in the BNF and PNF Forest Plans Appendix F should be used to help guide facility development and recreation activity management within each ROS class. When a structure or facility is created for other than public use, the materials, color, and location should be chosen to reduce visual contrast of the structure. Natural or neutral colors should be used in to help structures blend with the landscape. The use of natural or neutral colors and non-reflective surfaces would be considered for structures. An exception to this would be when the function of the structure is to be seen.</td>
<td>FP Component</td>
<td>BNF and PNF: FRGU13, SCGU13, SCGU14, SCGU15, BNF: REGU12, REGU15, PNF: REGU13, REGU16</td>
<td>Scenic Resources, Tribal Resources</td>
</tr>
<tr>
<td>Reclamation cover material (e.g., growth media) used in places including but not limited to the TSF and TSF Buttress would be evaluated for contaminants prior to use during reclamation. Acceptable metal/contaminant concentrations and sampling and testing methodology would be documented in a sampling and analysis plan developed prior to reclamation.</td>
<td>Design Feature</td>
<td></td>
<td>Soil, Water, Public Safety</td>
</tr>
<tr>
<td>Topsoil and any brush removed would be stockpiled separate from fill material and used in reclamation.</td>
<td>Design Feature</td>
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<td>Soils</td>
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<td>Description</td>
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<td>Measures such as, but not limited to, segregating and stockpiling topsoil, implementing stormwater and sediment best management practices (BMPs), backfilling, revegetation and concurrent reclamation would be conducted, where possible and practical, for areas where the soil has been exposed by ground-disturbing activities. These areas/sites include, but are not limited, to burrow sites, utility corridors, skid trails, firebreaks, temporary roads, cut and fill slopes, and areas where construction activities have occurred.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: SWST03, SWGU05</td>
<td>Soils, Vegetation, Timber, Transportation and Access, Water, Wetlands, Fish</td>
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<tr>
<td>Applicable road obliteration for all roads proposed for obliteration including temporary roads and applicable sections of the Burntlog route (if selected) would be fully recontoured, including full bench constructed road segments. Road obliteration through recontouring is the reclamation of a road template through the following: Deep decompaction (36”) of the inside half of the road surface; excavation of road fill down to the natural ground level and place on top of the decompacted inside half of the road surface on the cut slope side of road; Reestablish the natural slope profile; and Vegetation clump planting. Decompa...</td>
<td>Design Feature</td>
<td>Soils, Vegetation, Transportation and Access</td>
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<td>free agriculture straw to reach a minimum of 50 percent to the maximum 80% coverage of the recontoured surface or disturbed area. Apply native seed mix, hydromulch or organic fertilizer. This order or priority shall be given to vegetation plug planting, native mulch, coarse woody debris, and straw. When applying coarse woody debris, use various size classes at levels similar to surrounding undisturbed ground and placed at various orientations. The desired result of road obliteration through recontouring is to restore slope contours the natural slope profile, improve soil productivity, improve soil-water infiltration, and reestablish ground water flow paths and hydrologic function.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: SWST02 SWST03</td>
<td>Soils, Vegetation, Timber, Transportation and Access, Water, Wetlands, Fish</td>
</tr>
<tr>
<td>Road rutting from operations, outside the mine site, would be minimized by construction and maintenance of surface drainage structures, application of surfacing material, and by restricting road use when conditions are unacceptable due to moisture that is leading to the onset of rutting and concentrated turbid flow. (Note typical guidance is ‘no use’ if ruts deeper than 4” are created.) This design feature does not apply to the mine site.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: FRST05</td>
<td>Transportation and Access, Fish, Soils, Water Resources, Wildlife</td>
</tr>
<tr>
<td>Handling of road waste material (e.g., slough, rocks) would avoid or minimize delivery of waste material to streams that would result in degradation of soil, water, riparian, and aquatic resources.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: FRST05</td>
<td>Transportation and Access, Health and Safety</td>
</tr>
<tr>
<td>Commercial transport vehicles would be inspected at Knox or Landmark by the driver prior to accessing the Johnson Creek area.</td>
<td>Design Feature</td>
<td>BNF and PNF: MIST04, LSST07, MIST08, FRGU05</td>
<td>Transportation and Access, Health and Safety</td>
</tr>
<tr>
<td>Road clearing and maintenance activities for roads under Forest Roads and Trail Act (FRTA) easement agreements would be coordinated with Valley County, as necessary.</td>
<td>Design Feature</td>
<td>BNF and PNF: MIST04, LSST07, MIST08, FRGU05</td>
<td>Transportation and Access, Water Resources, Fish, Wetlands.</td>
</tr>
<tr>
<td>Mitigate degrading effects from locatable mine operations situated within RCAs by identifying reasonable locations for access, processing, and disposal facilities outside of RCAs, wherever possible.</td>
<td>FP Component</td>
<td>BNF and PNF: MIST04, LSST07, MIST08, FRGU05</td>
<td>Transportation and Access, Water Resources, Fish, Wetlands.</td>
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<td>To minimize the degradation of watershed resource conditions, prior to expected water runoff, water management features would be constructed, installed, and/or maintained. Activities and features include, but are not limited to, water bars, rolling dips, seeding, grading, slump removal, barriers/berms, distribution of slash, and culvert/ditch cleaning in all applicable areas.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: SWST01 and SWST04</td>
<td>Transportation and Access, Water Resources, Soils, Wetlands</td>
</tr>
<tr>
<td>To accommodate floods, including associated bedload and debris, new culverts, replacement culverts, and other stream crossings would be designed to accommodate a 100-year flood recurrence interval unless site-specific analysis using calculated risk tools or another method, determines a more appropriate recurrence interval.</td>
<td>FP Component</td>
<td>BNF and PNF: FRST02</td>
<td>Transportation and Access, Water Resources, Soils, Wetlands, Fish</td>
</tr>
<tr>
<td>To minimize sediment runoff from the temporary roads and roadbeds, water management features would be constructed, installed, and/or maintained on authorized temporary roads and roadbeds, on completion of use, before expected water runoff, or before seasonal shutdown. Activities and features could include, but would not be limited to, water bars, silt fencing, certified weed-free wattles, and/or weed-free straw bales, rolling dips, seeding, grading, slump removal, barriers/berms, distribution of slash, and culvert/ditch cleaning. These features would be installed in strategic downslope areas and in RCAs, where and when appropriate.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: SWGU06</td>
<td>Transportation and Access, Water Resources, Wetlands, Soils</td>
</tr>
<tr>
<td>Snow removal would be accomplished in accordance with the following standards of performance: All debris, except snow and ice, that is removed from the road surface and ditches would be deposited away from stream channels at approved locations. During snow removal operations, banks would not be undercut, and gravel or other surfacing material would not be bladed off the roadway surface. Ditches and culverts would be kept functioning during and following plowing. Berms left on the shoulder of the road would be removed and/or drainage openings would be created and maintained. Drainage openings would be spaced to maintain satisfactory surface drainage without discharge on erodible fills. Dozers would be used on an as-needed basis for plowing snow. The dozer operator would maintain an adequate snow floor over the gravel road surface. Snow would not be totally removed to the gravel road surface. Appropriate snow floor depth would be maintained to protect the roadway. Damage of roads from, or as a result of, snow removal would be repaired in a timely manner. Culverts and stream crossings would be clearly marked before snow removal begins to avoid placing berm openings in</td>
<td>Design Feature</td>
<td></td>
<td>Transportation and Access, Water Resources, Wetlands, Fish</td>
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<td>locations that would allow runoff to enter drainages directly at the culverts or stream crossings. Excessive snow would not be plowed into locations that would impact operation of the culverts or prevent positive drainage from drainage areas. Some snow is necessary around culvert openings and in the bar ditches as this would insulate the ditch and culvert and would prevent the water in the ditch and culvert from freezing. No ice and snow removal chemicals would be used on roads. Traction material would be 3/8-inch diameter gravel or greater.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: BTST02</td>
<td>Vegetation</td>
</tr>
<tr>
<td>If sensitive plants or their propagules are required to be collected, collection methods and other information will be under the direction of the Forest or Regional Botanist.</td>
<td>Design Feature</td>
<td>Design Feature</td>
<td>Vegetation</td>
</tr>
<tr>
<td>For projects or activities that include application of insecticides, herbicides, fungicides, or rodenticides, degrading effects on sensitive plant species will be mitigated.</td>
<td>FP Component</td>
<td>BNF and PNF: BTST02</td>
<td>Vegetation</td>
</tr>
<tr>
<td>In revegetation and seeding projects in occupied TEPC plant habitat, a Forest botanist shall be consulted to ensure appropriate species are used.</td>
<td>FP Component</td>
<td>BNF and PNF: TEST09</td>
<td>Vegetation</td>
</tr>
<tr>
<td>When available and not cost-prohibitive, seeds and plants used for seedings and plantings in revegetation projects should originate from genetically local sources of native species. When project objectives justify the use of non-native plant materials, documentation explaining why non-natives are preferred should be part of the project planning process.</td>
<td>FP Component</td>
<td>BNF and PNF: BTGU03</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Noxious weeds and undesirable non-native plants would be eradicated in the Operations Area boundary, within permitted use areas, and the cut/fill slopes of roads and trails used by mine and mine facility related traffic. Where it is not practical to eradicate existing infestations, infestations would be managed to prevent seed production and spread. In areas of existing extensive infestation, mitigation for noxious weed prevention would be incorporated into road layout, design, and project alternative evaluation.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: FRGU02, TEST10</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Clean borrow and gravel sources on Forest should be maintained as noxious weed free through an inspection and treatment program. Off-Forest inspections and treatments should be coordinated with county weed agents.</td>
<td>FP Component</td>
<td>BNF and PNF: NPGU02</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Only certified noxious weed-free hay, straw, or feed is allowed on NFS lands.</td>
<td>FP Component</td>
<td>BNF and PNF: NPST01</td>
<td>Vegetation</td>
</tr>
<tr>
<td>All seed used on National Forest System lands will be certified to be free of seeds from noxious weeds listed on the current All States Noxious Weeds List.</td>
<td>FP Component</td>
<td>BNF and PNF: NPST02</td>
<td>Vegetation</td>
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Materials such as hay, straw, or mulch that are used for rehabilitation and reclamation activities shall be free of noxious weed seed and shall comply with the 1995 weed-free forage special order against use of non-certified hay, straw, or mulch. Materials that are not covered under a weed seed free certification, and that have the potential to contain noxious weed seed, shall be inspected and determined to be free of weed seed before purchase and use.

Source sites for gravel and borrow materials shall be inspected for noxious weeds before materials are processed, used, or transported from the source site into the project area or onto the National Forest.

Gravel or borrow material source sites with noxious weed species present shall not be used unless effective treatment or other mitigation measures are implemented.

To prevent invasion/expansion of noxious weeds, the following provisions will be included in the plan of operating where land-disturbing activities are associated with the authorized land use):

a) Re-vegetate areas, as designated by the Forest Service, where the soil has been exposed by ground-disturbing activity. Implement other measures, as designated by the Forest Service, to supplement the influence of re-vegetation in preventing the invasion or expansion of noxious weeds. Potential areas would include: construction and development sites, underground utility corridors, skid trails, landings, firebreaks, slides, slumps, temporary roads, cut and fill slopes, and travel ways of specified roads.

b) Earth-disturbing equipment used on National Forest System lands--such as cats, graders, and front-loaders--shall be cleaned to remove all visible plant parts, soil, and material that may carry noxious weed seeds. Cleaning shall occur prior to entry onto the project area and again upon leaving the project area if the project area has noxious weed infestations. This also applies to fire suppression earth-disturbing equipment contracted after a Wildland Fire Situation Analysis/Wildland Fire Implementation Plan has been completed.

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<td>Materials such as hay, straw, or mulch that are used for rehabilitation and reclamation activities shall be free of noxious weed seed and shall comply with the 1995 weed-free forage special order against use of non-certified hay, straw, or mulch. Materials that are not covered under a weed seed free certification, and that have the potential to contain noxious weed seed, shall be inspected and determined to be free of weed seed before purchase and use.</td>
<td>FP Component</td>
<td>BNF and PNF: NPST06</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Source sites for gravel and borrow materials shall be inspected for noxious weeds before materials are processed, used, or transported from the source site into the project area or onto the National Forest.</td>
<td>FP Component</td>
<td>BNF and PNF: NPST07</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Gravel or borrow material source sites with noxious weed species present shall not be used unless effective treatment or other mitigation measures are implemented.</td>
<td>FP Component</td>
<td>BNF and PNF: NPST08</td>
<td>Vegetation</td>
</tr>
<tr>
<td>To prevent invasion/expansion of noxious weeds, the following provisions will be included in the plan of operating where land-disturbing activities are associated with the authorized land use):</td>
<td>FP Component</td>
<td>BNF and PNF: NPST03</td>
<td>Vegetation</td>
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<tr>
<td>Integrated weed management shall be used to maintain or restore habitats for sensitive plants and other native species of concern where they are threatened by noxious weeds or non-native invasive plants. Specific measures to reduce the potential for spread and establishment of noxious weed infestations could include, but are not limited to, determining the presence, location, and amount of noxious weed infestations in the Operations Area, developing management strategies such as, methods and frequency for treating infestations, treatment procedures and restrictions, reporting requirements, and follow-up or monitoring requirements. Herbicide applications will be by or under the direct supervision of licensed Idaho professional herbicide applicators with Aquatic Pest Control certifications and will be consistent with the BNF Invasive Species Management Plan and PNF guidance.</td>
<td>FP Component and Design Features</td>
<td>Design Feature developed for compliance with BNF and PNF: NPST11</td>
<td>Vegetation</td>
</tr>
<tr>
<td>New facilities for storage of fuels and other toxicants would be located outside of occupied Threatened, Endangered, Proposed, or Candidate (TEPC) plant habitat.</td>
<td>FP Component</td>
<td>BNF and PNF: TEST11</td>
<td>Hazardous Materials, Water Resources, Fish, Health and Safety, Vegetation</td>
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<tr>
<td>Public firewood cutting and gathering along the Burntlog route, if that alternative is selected and the route is open to the public, would not be allowed.</td>
<td>Design Feature</td>
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<td>Vegetation</td>
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<tr>
<td>Mitigate, through avoidance or minimization, management actions within known winter roosting sites of TEPC species if those actions would adversely affect the survival of wintering or roosting populations. During project planning, determine sites, periods, and appropriate mitigation measures to avoid or minimize effects.</td>
<td>FP Component</td>
<td>BNF and PNF: TEST13 WIST03</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Section 6 of IDL’s Best Management Practices for Mining in Idaho (IDL 1992) would be observed, including if water is encountered in exploration holes, water zones would be sealed off during abandonment to prevent crossflow.</td>
<td>Regulatory Requirement</td>
<td>Section 6 of IDL’s Best Management Practices for Mining in Idaho (IDL 1992)</td>
<td>Water Resources</td>
</tr>
<tr>
<td>The proponent would implement surface water quality baseline turbidity monitoring, as defined in the IDEQ permit clauses.</td>
<td>Design Feature</td>
<td>-</td>
<td>Water Resources, Fish</td>
</tr>
<tr>
<td>Do not authorize storage of fuels and other toxicants or refueling within RCAs unless there are no other alternatives. Storage of fuels and other toxicants or refueling sites within RCAs shall be approved by the responsible official and have an approved spill containment plan commensurate with the amount of fuel.</td>
<td>FP Component</td>
<td>BNF and PNF: SWST11</td>
<td>Water Resources, Fish, Wetlands, Hazardous Materials, Health and Safety</td>
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<td>Dust abatement chemicals would be used in accordance with the applicable road maintenance Biological Assessment. Apply dust-abatement additives and stabilization chemicals (typically MgCl₂, CaCl₂, or lignin sulphonates) to avoid run-off of applied dust abatement solutions to streams. Spill containment equipment would be available during chemical dust abatement application. Where the road surface is within 25 feet (slope distance) of surface water, dust abatement would only be applied to a 10-foot swath down the centerline of the road. The rate and quantity of application would be regulated to ensure all of the chemical is absorbed before leaving the road surface.</td>
<td>Design Feature</td>
<td></td>
<td>Water Resources, Fish, Wetlands, Air Quality, Transportation and Access</td>
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<tr>
<td>Trees or snags that are felled in RCAs would be left unless determined not to be necessary for achieving soil, water, riparian, and aquatic desired conditions. Felled trees or snags left in RCAs would be left intact unless resource protection (e.g., the risk of insect infestation is unacceptable) or public safety requires bucking them into smaller pieces.</td>
<td>FP Component</td>
<td>BNF and PNF: SWST10</td>
<td>Water Resources, Soil, Fish, Vegetation</td>
</tr>
<tr>
<td>The proponent would monitor stormwater runoff and stormwater BMPs as per the Stormwater Pollution Prevention Plan (SWPPP). Stormwater monitoring, inspections, and reporting would be conducted in accordance with the IPDES MSGP and the SWPPP.</td>
<td>Permitting Requirement</td>
<td>IPDES MSGP and the SWPPP</td>
<td>Water Resources, Soils</td>
</tr>
<tr>
<td>All activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations at IDAPA 58.01.02 and applicable federal regulations.</td>
<td>IDAPA 58.01.02</td>
<td></td>
<td>Water Resources, Wetlands, Fish</td>
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<tr>
<td>If additional water rights are applied for, the Forest Service would be informed to determine if additional analysis or consultation is necessary prior to use.</td>
<td>Design Feature</td>
<td></td>
<td>Water Rights</td>
</tr>
<tr>
<td>Road reconstruction and/or upgrades to NFR 51290 (Meadow Creek Lookout Road) on the ridgeline dividing Meadow Creek from the Indian Creek drainage would be restricted to 30 feet either side of the centerline of the existing alignment to prevent potential for direct impacts to the Frank Church River of No Return Wilderness (FCRNRW).</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: LSST03, LSST05</td>
<td>Wilderness</td>
</tr>
<tr>
<td>Mitigate management actions within known winter roosting sites or hibernacula (bats) of Sensitive species if those actions would measurably reduce the survival of wintering or roosting populations. Sites, periods, and mitigation measures will be determined during project planning.</td>
<td>FP Component</td>
<td>BNF and PNF: WIST04</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Description</td>
<td>Type</td>
<td>Reference</td>
<td>Resources Affected</td>
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</tr>
<tr>
<td>To mitigate impacts to known nesting or denning sites of Management Indicator Species (MIS) or Sensitive species, land clearing activities in areas where complete vegetation removal is necessary greater than 0.5 acres would not occur, to the extent possible, until after the bird breeding season (April 1 through July 30th) for migratory and resident birds. This design feature does not apply to the mine site, road construction or maintenance, hazard tree felling, or the power line upgrades and construction.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: WIST03</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Potential water sources would be surveyed by the proponent, in coordination with the Forest Service, for Columbia spotted frog egg masses and other amphibians after ice melt and avoid disturbing any water sources with identified egg masses or other species. Exceptions: If egg masses are found at a water source essential for proposed activities, the egg masses would be relocated in coordination with the Forest Service wildlife biologist.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: WIST03, TEST12</td>
<td>Wildlife</td>
</tr>
<tr>
<td>The Forest Service wildlife biologist would be notified of any sightings of TEPC or Sensitive wildlife species, including, occupied sensitive species nests or dens encountered during implementation. If necessary to maintain key features of nesting/denning habitat or to avoid disruption of nesting/denning activities, prescribed activities would be modified in accordance with the Forest Service wildlife biologist.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: WIST03, TEST12</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Where practicable, monitoring of high elevation habitats characteristic of wolverine denning habitat would be done in cooperation with State fish and game agencies.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF: WIGU17</td>
<td>Wildlife</td>
</tr>
<tr>
<td>To minimize adverse effects of lighting to TEPC, MIS, or Sensitive species, where necessary and in accordance with MSHA and the Occupational Safety and Health Administration (OSHA), the proponent could utilize actions in line with, but not limited to, the below: To the extent practicable, limit construction activities to the time between dawn and dusk. Utilize, where possible, use down shielding or directional lighting such as 'Cobra' style lights rather than an omnidirectional light system. While allowing for public and worker safety, utilize low intensity energy saving lighting (e.g., low pressure sodium lamps). If possible, minimize illumination of lighting on associated construction or operation structures by using motion sensors or heat sensors.</td>
<td>Design Feature</td>
<td>Design Feature developed for compliance with BNF and PNF: WIST03, WIST04 TEST29</td>
<td>Wildlife</td>
</tr>
</tbody>
</table>
If possible, place light shields over outside lights, confining light to the immediate area. Whisper Quiet light plants could be utilized used to mitigate visual impacts from night operations.

Communication towers should not be sited in or near wetlands, or other known bird concentration or high use areas (e.g., riparian corridors), in known migratory or daily movement flyways. Towers should not be sited in areas with a high incidence of fog, mist, and low ceilings.

To minimize adverse effects of noise to TEPC, MIS, or Sensitive species, where necessary and in accordance with MSHA and OSHA, the proponent could utilize actions in line with, but not limited to, the below:

- Construction equipment engines would be equipped with adequate mufflers, intake silencers, and engine enclosures when feasible.
- When practicable, pumps, generators, and engines would be turned off when not in use.
- Temporary wooden structure could be erected around portions of the drill, pumps, and heaters, with acoustic absorbent panels. These temporary structures would not be put in place if they created safety issues related to exhaust vapor build-up.
- When feasible, activities such as helicopter use and blasting, could be scheduled at the same time.

Design and implement projects within occupied habitats of Sensitive species to help prevent them from becoming listed. Use Forest Service-approved portions of Conservation Strategies and Agreements, as appropriate, in the management of Sensitive species habitat to keep management actions from contributing to a trend toward listing for these species.

### Table 2.4-13  Proponent Proposed Design Features

<table>
<thead>
<tr>
<th>Description</th>
<th>Resources Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following crushing, the crushed ore would report via conveyor to a dome-shaped, covered stockpile.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Dust emission controls would reduce dust from crushing, conveying, and stockpiling.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Dust would be controlled in a similar manner to the ore crushing and conveying process using water sprays and/or bag house dust collectors.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Air emissions from the leaching facility would be captured in a series of air pollution controls, and the material collected would be disposed of as a solid waste or a hazardous waste depending on characterization of the waste.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Air emissions from the induction furnace would be captured in a series of emission controls. Mercury from the induction furnace would be converted to a liquid metallic state, and then securely stored prior to shipment to a certified hazardous waste disposal facility.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Silos would be equipped with air emission controls except for Prill Silo.</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>All off-highway diesel engines would be EPA Tier IV or better.</td>
<td>Air Quality, Climate Change</td>
</tr>
<tr>
<td>Perpetua would encourage employees to use company provided shuttle buses as transport to the SGLF from towns along SH 55.</td>
<td>Air Quality, Health and Safety, Transportation and Access</td>
</tr>
<tr>
<td>Busing and/or vanpooling would be provided for Perpetua and contractor employees. The associated parking area would accommodate approximately 300 vehicles. To the degree practicable, Perpetua would mandate the use of busing and vans for employee and contractor transportation to the SGP and the worker housing facility.</td>
<td>Air Quality, Health and Safety, Transportation and Access</td>
</tr>
<tr>
<td>Proper dust control would be employed along transportation corridors and active mining areas using aquatic safe dust suppression chemicals and methods.</td>
<td>Air Quality, Water Resources, Fish, Wildlife</td>
</tr>
<tr>
<td>Perpetua would utilize “smart grid” technology to reduce energy consumption, such as auto dimming lights in offices.</td>
<td>Climate Change</td>
</tr>
<tr>
<td>Perpetua employees and contractors would be informed about relevant governmental regulations intended to protect cultural and historic resources.</td>
<td>Heritage</td>
</tr>
<tr>
<td>To protect fish residing in, using, or potentially using the Yellow Pine Pit lake (Chinook salmon, steelhead trout, bull trout, Westslope cutthroat trout, mountain whitefish), Perpetua has developed a Fish Salvage and Release Plan to isolate the lake from upstream movement into the lake and salvage and release fish. The Fish Salvage and Release Plan would be refined in coordination with federal, state, and tribal agencies. Perpetua would, in consultation with the USFWS and the NMFS (the Services), design, install, and operate a fish trap and one or two weirs designed to allow fish to leave the Yellow Pine pit lake but not allow fish to migrate upstream past the trap to ensure that the fewest number of individual ESA-listed fish species are present in the pit lake when the draining process begins. The timing for providing the upstream barrier to fish movement would be designed to minimize the number of fish in the Yellow Pine pit lake, particularly larger bull trout. Fish captured in the Yellow Pine pit lake would be immediately released downstream of the upstream fish movement barrier or in another location determined by the appropriate regulatory agencies. The Yellow Pine pit lake would be partially drained to recover the remaining fish and relocate them prior to final draining of the pit lake. A fishway has been designed and would be operated within the East Fork SFSR tunnel to provide upstream and downstream volitional fish passage throughout mine operations. The East Fork SFSR diversion tunnel would be approximately 0.9 miles long and 15 feet high by 15 feet wide. The tunnel would include a parallel accessway to allow equipment and personnel access for monitoring, inspection, and maintenance. The accessway would function as a floodway for high flows, limiting the operating flow range within the fishway while river and thus total tunnel flows vary more widely. As an alternative to the fishway in the East Fork SFSR tunnel Perpetua would provide adult passage by trap and haul if needed. Criteria may be put in place so that if any unusual or unexpected events occur that result in adverse impacts to fish during operations, fish passage through the fishway would be switched to trap and haul operations.</td>
<td>Fish</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Low-energy lighting would be provided in the fishway to determine if it aids in fish passage and to provide light for tunnel and fishway inspections. The system would be configured so that it mimics the photoperiod of the region, run manually on a dimming system, or be completely turned off at the option of the operator.</td>
<td>Fish</td>
</tr>
<tr>
<td>Fish salvage and relocation operations would be conducted any time the facility needs repair within the fishway, potentially during sediment removal, and potentially when streamflows recede from the accessway.</td>
<td>Fish</td>
</tr>
<tr>
<td>Post mining, the East Fork SFSR stream channel would be reestablished across the backfilled Yellow Pine pit with a channel design that would provide for upstream and downstream fish passage.</td>
<td>Fish</td>
</tr>
<tr>
<td>Perpetua would reestablish fish passage at the location of the existing box culvert on the East Fork SFSR just downstream of the confluence with Meadow Creek at the McCall-Stibnite Road (CR 50-412) crossing.</td>
<td>Fish</td>
</tr>
<tr>
<td>Perpetua would improve fish passage along the Burntlog Route within the SGP area by identifying and replacing existing collapsed, undersized, or otherwise degraded or poorly designed culverts at road crossings and committing appropriate resources to fix and improve these structures.</td>
<td>Fish</td>
</tr>
<tr>
<td>Perpetua would install side-ditching, culverts, guardrails, and bridges, where necessary along the Burntlog Route, with design features to provide fish passage and limit potential sediment delivery to streams.</td>
<td>Fish</td>
</tr>
<tr>
<td>Perpetua would employ blasting setback distances and other controlled blasting techniques following industry best management practices (modifying blasting variables including charge size, and vibration and overpressure monitoring) to minimize impacts to fish from blasting. Perpetua would follow up with monitoring in early stages of operation to evaluate effectiveness and refine blasting protocols in coordination with federal, state, and tribal agencies, if needed.</td>
<td>Fish</td>
</tr>
<tr>
<td>Dewatering of the Yellow Pine pit lake or stream segments would generally be conducted during low-flow periods to facilitate stream segment isolation and fish salvage. When practicable, dewatering also would be timed to avoid or minimize impacts during known spawning periods for Chinook salmon, steelhead, and bull trout.</td>
<td>Fish</td>
</tr>
<tr>
<td>To protect fish, Perpetua would develop a standard procedure for channel segment isolation, dewatering, fish salvage, and fish relocation to appropriate receiving streams during dewatering or maintenance of natural stream and diversion channels, based on the USFWS Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards (USFWS 2012) and refined in coordination with federal, state, and tribal agencies.</td>
<td>Fish</td>
</tr>
<tr>
<td>The fishway operations and management plan (FOMP) defines the monitoring and evaluation plan elements and describes how the hydraulic conditions, fish use, and performance of the tunnel fishway would be measured and evaluated, and the design of the adaptive management component of the plan including the option of using trap and haul.</td>
<td>Fish</td>
</tr>
<tr>
<td>Access and SGP haul road crossings of fish bearing streams would be designed such that structures installed or constructed allow fish passage.</td>
<td>Fish and Wildlife</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Perpetua would implement measures to limit stream baseflow effects during active operations, including a combination of lining key reaches of streams potentially impacted by pit dewatering, and treating and discharging pit dewatering water that is not used for ore processing or other industrial uses. Maintain instream flows for fish species and other aquatic resources: flows within natural stream channels affected by SGP operations would be maintained to meet seasonally appropriate and stream-specific low-flow needs to the maximum extent practicable. Perpetua would continue to evaluate options and measures to further avoid and minimize the magnitude and duration of effects of the SGP through other measures in consultation with federal, state, and tribal agencies.</td>
<td>Fish, Water Resources</td>
</tr>
<tr>
<td>Following permanent cessation of mining activities at the Yellow Pine pit, Perpetua would backfill the pit and route the East Fork SFSR over the backfilled pit with a longer, lower-gradient channel with higher intrinsic potential for Chinook salmon and steelhead spawning and rearing than the channel that exists presently. The floodplain area along the constructed channel would include side-channels and other off-channel features and would be revegetated to restore wetland and riparian habitat providing long-term shade/cover favorable to fish.</td>
<td>Fish, Wetlands</td>
</tr>
<tr>
<td>The Meadow Creek channel would be routed over the final TSF and TSF Embankment and Buttress, resulting in a long, relatively flat surface and a short, steep face. On top of the TSF surface, Meadow Creek would be contained within a broad floodplain corridor bound laterally by erosion-resistant terraces and vertically by a subsurface armor layer over a low-permeability stream liner.</td>
<td>Fish, Wetlands</td>
</tr>
<tr>
<td>Perpetua would stabilize and restore Blowout Creek. Blowout Creek wetland restoration would consist of restoring and enhancing palustrine aquatic bed (PAB), palustrine emergent (PEM), Palustrine scrub-scrub (PSS) wetlands that were impacted when a historical dam failed on Blowout Creek. Headcutting and shallow aquifer dewatering have impaired and reduced functions of the wetland vegetation classes. A grade control and groundwater cutoff structure is proposed to raise the water level in Blowout Creek as well as recharge the shallow groundwater system and reduce stream headcutting. A coarse rock drain would be constructed within the chute downstream of the failed dam to isolate the flow of Blowout Creek from the actively eroding chute side slopes and to prevent further erosion of the gully bottom, facilitating subsequent restoration of a surface channel on top of the drain. Perpetua would stabilize the steep, confined, erosive middle reach to address the significant fine sediment load currently produced from this reach and restore the downstream, relatively low-gradient reach.</td>
<td>Fish, Wetlands, Water Resources</td>
</tr>
<tr>
<td>Perpetua would lead annual site visits for USACE, EPA, IDFG, and other interested agency personnel as needed to facilitate agency review of mitigation areas if desired. Final reporting and data archival requirements would be subject to permit conditions; however, it is anticipated that until the USACE concurs that mitigation sites meet success criteria, monitoring reports would be prepared by Perpetua annually and submitted to USACE Walla Walla District, EPA, IDFG, IDL, National Oceanic and Atmospheric Administration (NOAA) Fisheries, USFWS, the Forest Service, and other interested agencies, SGP partners, and stakeholders. After success criteria are met, permit conditions will set the frequency for long-term monitoring and reporting.</td>
<td>Fish, Wetlands, Water Resources</td>
</tr>
<tr>
<td>Perpetua would repair and rehabilitate habitats adversely affected by historical mining impacts in the SGP area within the disturbance footprint of the modified mine plan.</td>
<td>Fish, Wetlands, Water Resources</td>
</tr>
<tr>
<td>Minor surface improvements (e.g., ditch and culvert repair, adding gravel, winter snow removal, and summer dust suppression) would occur on the Yellow Pine Route to reduce sediment runoff and dust generation.</td>
<td>Fish, Wildlife, Water Resources</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Implementation of an avalanche hazard management program that &quot;could&quot; include avalanche control and/or road closure. Also proposed is daily region-scale assessments; daily weather observations including snowpack and avalanches; notifying SGP staff of highly unstable conditions; closing roads during periods of elevated hazard or blocked roads; and controlling avalanche initiation with explosives. Section 7.2 of DAC (2021) provides a description of an active avalanche monitoring and control program that has more specific descriptions of the components that could be included in an SGP-specific plan. Section 8.0 of Dynamic Avalanche Control (DAC; 2021) includes a discussion of avalanche controls likely to be necessary for the avalanche paths identified and this should be included in the program discussed above. Perpetua would provide for Forest Service review a written avalanche monitoring and control program that could be implemented for the SGP.</td>
<td>Geotechnical Hazards</td>
</tr>
<tr>
<td>Construction and operation of snow catchment areas for smaller avalanche paths. Section 7.3 of DAC (2021) includes a more detailed discussion of specific locations and design characteristics for ditches and catchment areas to reduce avalanche impacts to roads. Perpetua would review this information and current road designs to provide for Forest Service review specific designs and maintenance/operating plans for said ditches and catchment areas along the selected access route.</td>
<td>Geotechnical Hazards</td>
</tr>
<tr>
<td>Avalance structural defense options that could be beneficial in the SGP mine site to protect high-value, stationary facilities from avalanche hazards. Perpetua would review this information and provide the Forest Service with any recommendations for implementing structural avalanche defenses in at the SGP mine site.</td>
<td>Geotechnical Hazards</td>
</tr>
<tr>
<td>Perpetua would increase the ground limestone dosage to the pre-oxidized concentrate as it is fed into the autoclave to address the potential for creation of soluble arsenic. By decreasing the free acid levels (increasing the pH) in the autoclave by increasing the ground limestone dosage in the autoclave feed increases the quantity of crystalline (stable) arsenic compounds in the resultant slurry with a proportional decrease in the quantity of amorphous (unstable) arsenic compounds.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Perpetua would monitor levels of soluble arsenic in the tailings. If soluble arsenic levels are higher than anticipated, Perpetua would treat the oxidized concentrate with HAC prior to neutralization.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>The ore processing area would be designed to provide for containment of ore processing materials, chemicals, wastes, and surface runoff. Potentially hazardous chemicals and wastes would be stored within buildings or areas with both primary and secondary containment. Surface runoff within the ore processing area would be directed to a contact water pond for collection. Leaks or spills escaping primary and secondary containment would flow to the contact water pond for collection and would not discharge off site.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>The processing circuit would be housed in a steel frame building set on concrete foundations with interior curbing to provide secondary containment; the interior curbing would be high enough to contain 110 percent of the volume of the largest tank.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>The gold and silver leaching circuit would be designed and operated consistent with the International Cyanide Management Institute Code (ICMC) (<a href="https://www.cyanidecode.org">https://www.cyanidecode.org</a>) and the Initiative for Responsible Mining Assurance (IRMA) Standard for Responsible Mining (<a href="https://responsiblemining.net/resources/">https://responsiblemining.net/resources/</a>). Accordingly, impermeable secondary containment for cyanide unloading, storage, mixing and process tanks shall be sized to hold a volume at least 110 percent of the largest tank within the containment and any piping draining back to the tank, with additional capacity for the design storm event, if applicable. Pipelines containing process water or process solution shall also use secondary containment in combination with audible alarms, interlock systems, and/or sumps as spill control measures.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Cyanide-bearing solutions used in ore processing would be neutralized to approximately 10 milligrams per liter weak acid dissociable (WAD) cyanide before the material is pumped to the TSF. Residual cyanide would be treated using a sodium metabisulfite and air system to detoxify the cyanide by oxidation to form cyanate.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Cyanide would be neutralized to levels protective of wildlife, and the TSF would be surrounded by an 8-foot high, chain-link fence designed to keep wildlife, such as deer and elk, from entering the impoundment area, to prevent either liner damage or wildlife drowning.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Oils, solvents, and lubricants would be stored in approved containers located within, or directly adjacent to, the maintenance shop and contained within secondary containments to prevent spills into the environment. All used petroleum products, waste antifreeze, and used solvents would be collected in approved containers, transported off site, and disposed or recycled.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Nitric and sulfuric acid would be transported in tanks designed to prevent spills even in the event of rollovers.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Nitric and sulfuric acids would be stored in specialized non-corrosive, polyethylene-lined tanks located within the ore processing facility and would have secondary containment.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Liquids would be shipped to the SGP in tank trucks designed for spill prevention and escorted to the SGP by pilot cars manned and equipped to handle spills.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Other legacy materials may be encountered during construction and operations. If encountered, these materials would be characterized to determine potential for reprocessing, reuse, or disposal.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>Small scale composting associated with organic materials generated at the worker housing facility may be incorporated within the centralized GMS in the Fiddle valley.</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td>An Explosives and Blasting Management Plan would be prepared for the SGP. Explosives storage, transport, handling, and use would comply with applicable Department of Homeland Security, Bureau of Alcohol, Tobacco, Firearms and Explosives, and MSHA regulations.</td>
<td>Health and Safety</td>
</tr>
<tr>
<td>For safety and security reasons, no alcohol, firearms, or illegal drugs would be permitted on site.</td>
<td>Health and Safety</td>
</tr>
<tr>
<td>For safety and security reasons, public access into the mine area would be prevented by using fencing, gate locking, security personnel, and/or notice postings that prohibit unauthorized entry; no unauthorized vehicles or personnel would be permitted on the SGP.</td>
<td>Health and Safety</td>
</tr>
<tr>
<td>Personnel transporting, handling, or using any hazardous chemicals (including sodium cyanide) would be trained to ensure the safe use of such materials. Perpetua would design, construct, and manage facilities to conform to ICMC.</td>
<td>Health and Safety, Fish, Wildlife, Hazardous Materials</td>
</tr>
<tr>
<td>Fuel and other petroleum products at the site would be stored in above ground containment structures, with appropriate secondary containment measures.</td>
<td>Health and Safety, Fish, Wildlife, Hazardous Materials</td>
</tr>
<tr>
<td>Air emissions, groundwater, surface water, and aquatic parameters would be monitored during mine construction, operation, closure, and post-closure as specified in the final authorizations from the regulating agencies.</td>
<td>Monitoring</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Monitoring would be conducted following the completion of closure and reclamation of all facilities and disturbance areas to demonstrate compliance with permit requirements and to measure the success of reclamation and mitigation.</td>
<td>Monitoring</td>
</tr>
<tr>
<td>The draft EMMP includes the following plans for monitoring aquatic resources: Stream and Wetlands Monitoring and Management Plan and Fisheries and Aquatic Habitat Monitoring and Management Plan.</td>
<td>Monitoring</td>
</tr>
<tr>
<td>The ore processing facility building would be enclosed.</td>
<td>Noise, Wildlife, Health and Safety</td>
</tr>
<tr>
<td>Appropriate sound dampening and muffling equipment would be utilized to minimize noise excursion from equipment and facilities. When possible, schedule high noise activities at the same time. Monitor and maintain equipment to reduce noise related impacts.</td>
<td>Noise, Wildlife, Health and Safety</td>
</tr>
<tr>
<td>When practicable, pumps, generators, and engines would be turned off when not in use to avoid unnecessary noise generation and reduce energy consumption.</td>
<td>Noise, Wildlife, Health and Safety</td>
</tr>
<tr>
<td>Electric line power would be utilized during operations to eliminate diesel generator noise, except in emergency situations when grid power is down or temporary use in remote areas where it is not practical to run power lines.</td>
<td>Noise, Wildlife, Health and Safety</td>
</tr>
<tr>
<td>An 8-mile temporary 16-foot-wide groomed OSV trail would be created adjacent to Johnson Creek Road between Landmark and Trout Creek Campground during construction of the Burntlog Route.</td>
<td>Recreation</td>
</tr>
<tr>
<td>A 16-foot-wide groomed OSV trail would be created south of Warm Lake Road to connect the southern end of Johnson Creek Road to the Landmark- Stanley Road. This 0.3-mile route would be used throughout construction and operations.</td>
<td>Recreation</td>
</tr>
<tr>
<td>During construction, approximately 13 miles of groomed OSV trail would be maintained along Cabin Creek Road (FR 467).</td>
<td>Recreation</td>
</tr>
<tr>
<td>Suitable surface coatings or exterior design features would be used on SGP buildings and other structures to reduce visual impacts.</td>
<td>Scenic Resources</td>
</tr>
<tr>
<td>Lighting would be managed within active mining areas to avoid unintended lighting of natural, wildlife usage areas. External lighting would be kept to the minimum required for safety and security purposes. Lights would be directed down toward the interior of the SGP and shielded, where appropriate.</td>
<td>Scenic Resources, Wildlife</td>
</tr>
<tr>
<td>Approximately 37% of the reclamation would be done concurrent to mining and ore processing; the remaining 63% would be accomplished during closure.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>The Yellow Pine pit would be backfilled with West End pit development rock during operations.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>A sinuous channel would be constructed through the backfilled area for the reconstructed East Fork SFSR with an average valley gradient approximating the historical, pre-disturbance river gradient.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>The backfill would be placed to achieve a mounded final reclamation surface to promote drainage away from the West End pit and prevent formation of a pit lake within Midnight pit.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>The floor of the sidehill pit southwest of the main West End pit would be graded to drain, covered with growth media, and revegetated.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Perpetua would begin with placement of soil/rock cover material, then construct wetlands and restore Meadow Creek and its tributaries within appropriately sized lined floodplain corridors, place growth media, and revegetate the area.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Hangar Flats pit would be fully backfilled with development rock to the valley bottom elevation or slightly higher during mine operations. There would be no Hangar Flats pit lake.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Once all final mine closure/reclamation work has been completed, Perpetua would reduce the 21-foot-wide travel way of 19.8 miles of Burntlog Road (FR 447), 1.3 mile of Meadow Creek Lookout Road (FR 51290), and 2.0 miles along Thunder Mountain Road (FR 375) of Burntlog Route to their approximate pre-mining width.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>The approximately 15 miles of Burntlog Route connecting to Meadow Creek Lookout Road (FR 51290) and Thunder Mountain Road (FR 50375) would be decommissioned.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Following mining and ore processing operations, unless they are taken over by a third-party for ongoing use and maintenance, the Burntlog Maintenance Facility buildings would be removed. The sewer system and septic tanks for the facility would be decommissioned. Soil/rock beneath fuel storage areas and chemical storage buildings would be tested for contamination. All reagents, petroleum products, solvents, and other hazardous or toxic materials would be removed from the site and disposed of according to applicable state and federal regulations. After demolition of the buildings and facilities, the site would be graded, and drainage restored.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Perpetua would manufacture growth media material using screened fines from glacial till sources mined from the Yellow Pine pit, available mulched vegetation, and off-site composted material.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Planting, seeding, and mulching would be conducted in the fall and early winter to take advantage of snowpack and springtime moisture. Where cover crops are used in lieu of mulch, seeding would occur in the spring or fall followed by seeding of the permanent mixture.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Reclamation monitoring would begin during concurrent reclamation at SGP facilities. Quantitative and qualitative monitoring of reclamation success would begin the first growing season after final reclamation is completed and would continue until success criteria are satisfied.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Soil stability would be estimated for all reclaimed areas using qualitative descriptors.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Slope stability would be monitored during the erosion inspections.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>If the performance of reclaimed areas is not satisfactory, appropriate maintenance activities would be implemented. Maintenance activities may include one or more of the following: Sediment removal from sediment basins, stormwater drainage channels, and diversions as necessary to maintain their design capacity; Diverting surface water away from reclaimed areas where erosion jeopardizes attainment of reclamation standards; Stabilizing rills, gullies, and other erosion features or slope failures that have exposed development rock; Noxious weed and invasive plant species control; and, Re-seeding or re-applying reclamation treatments in areas where it is determined through monitoring and agency consultation that reclamation would not meet standards.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Perpetua would submit an annual report to the USFS and the other federal and state agencies that are responsible for issuing authorizations applicable to reclamation for the preceding calendar year. The annual report would contain descriptions of the reclamation activities completed during the previous year, a summary of areas reclaimed, a discussion of the results of the reclamation monitoring conducted, and corrective actions implemented.</td>
<td>Soils, Reclamation</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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</tr>
<tr>
<td>A new 12-foot-wide gravel road would be constructed to provide public access from Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375) through the SGP. During operations, the public access road would be used to travel through the SGP and would provide seasonal use, open to all vehicles. Vehicles passing through the SGP would be required to check-in with mine personnel at the North or South SGP entry points.</td>
<td>Transportation and Access, Health and Safety</td>
</tr>
<tr>
<td>Post reclamation, a road would be established over the backfilled Yellow Pine pit to allow public access through the reclaimed site and connect Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375). This would replace the operational phase public access route.</td>
<td>Transportation and Access</td>
</tr>
<tr>
<td>Prior to site preparation and construction of surface facilities, vegetation would be removed from operating areas. Merchantable timber on NFS surface lands could be purchased from the USFS. Non-merchantable trees, deadwood, shrubs, and slash would be removed, and any remaining vegetation would be grubbed using a bulldozer. The resulting material would be saved for future use in reclamation activities. Specifically, the organic matter would be chipped and stockpiled for use as mulch or blended to create a growth media additive. After vegetation removal, growth media would be salvaged and stockpiled. Stockpiles would be stabilized, seeded, and mulched to protect the stockpiles from wind and water erosion.</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Perpetua would inspect and remove vegetation material (including noxious weeds) from mechanical equipment and properly dispose to minimize the spread of unwanted vegetation.</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Wood wastes and wood mulch are the two primary sources of compost. Food waste produced from on-site meal preparation and wastes may provide another source. Combined and properly managed during composting, these materials would provide a source of organic matter to be blended into substrate materials suitable for mitigation.</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Perpetua would be responsible for noxious weed control within areas disturbed by SGP activities.</td>
<td>Vegetation, Wildlife</td>
</tr>
<tr>
<td>Develop and employ planting plans for wildlife benefits (cover, forage, etc.) using approved seed mixes.</td>
<td>Vegetation, Wildlife</td>
</tr>
<tr>
<td>Perpetua would use aquatic safe herbicides during vegetation management activities and noxious weed control. Adhere to chemical label restrictions, federal/state rules on usage. Use proper equipment for chemical application by trained personnel.</td>
<td>Vegetation, Fish</td>
</tr>
<tr>
<td>Perpetua or its designated contractor(s) would perform long-term maintenance as necessary, including maintaining and monitoring the Mitigation Area (including stream and wetlands) in perpetuity once the final performance standards are met or until such responsibility is relinquished to an appropriate third party (Forest Service, etc.) as approved by the USACE.</td>
<td>Vegetation, Wetlands</td>
</tr>
<tr>
<td>Perpetua would plant stream reclamation reaches and wetland reclamation areas with native plant species that are present in PAB, PEM, PSS, and palustrine forested wetlands and riparian areas along streams throughout the Mitigation Area.</td>
<td>Vegetation, Wetlands</td>
</tr>
<tr>
<td>To address stream temperature, riparian planting widths along restored and enhanced stream reaches would be 18 feet wide on each stream bank where possible. Taller and denser vegetation such as spruce trees would be planted. Further, the creation of the lined Stibnite Lake, a feature similar in size to the present Yellow Pine pit lake, would replace the function of the existing Yellow Pine pit lake in buffering stream temperature extremes and reduce maximum stream temperatures in East Fork SFSR in and downstream of the SGP.</td>
<td>Vegetation, Wetlands, Surface Water, Reclamation</td>
</tr>
<tr>
<td>Pre-construction water management activities would include the installation of surface water management features and implementation of best management practices to reduce erosion and sediment delivery to streams. These water management features and best management practices could include sedimentation ponds; run-on water diversion ditches, trenches, and/or berms; runoff water collection ditches; silt fence; water bars; culverts; energy dissipation structures; terraces; and other features specified in construction permits.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>Stormwater runoff from undisturbed areas upslope of mine features in the major drainages would be captured in the stream diversion channels described above or in other channels that would direct runoff away from disturbed areas. Smaller-scale diversion channels or earthen berms would be used, where necessary, to divert stormwater around other mine infrastructure.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Stormwater drains, ditches, and stream channels would be protected against erosion through a combination of adequate dimension, appropriate gradient, riprap, fabric-encapsulated soil lifts, or other stabilization materials. Diversions would be sized for a peak flow recurrence interval appropriate to the risk level of the facility, in recognition of other water management measures and fail-safes in place (excess flood storage and freeboard in the TSF, etc.), and in accordance with regulatory standards.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Existing streams that run through areas proposed for mining related disturbance would be diverted to prevent generation of contact water or commingling of contact and non-contact water, keeping clean water clean; and to prevent flooding of mine facilities by runoff generated off site.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Groundwater pumped from the dewatering wells would be considered to be contact water and would be managed through forced evaporation or active water treatment when the volume of pumped water exceeds the ore processing facility demand.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Channel segments constructed over fill or excavated in permeable materials would be constructed over a geosynthetic liner to reduce seepage. A transition layer of sand/gravel followed by riprap or similar would be placed over the liner for erosion protection.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Secondary containment for pipelines would consist of an open geosynthetic-lined trench, pipe-in-pipe, or backfilled geomembrane-wrapped trench, depending on location, and the pipeline corridor would drain to one of two pipeline maintenance ponds – one at the truck shop and one at the ore processing facility.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>A lined tailings pipeline maintenance pond would be located at the ore processing facility, to which tailings and process water in the tailings distribution or water reclaim pipelines would drain by gravity during maintenance shutdowns or if there is a leak in either pipeline. The pond would typically be empty except during maintenance or unforeseen problems with the tailings pipeline, pumping system, or TSF. The pond is designed to contain the contents of the pipelines and the runoff from the pond and lined pipeline corridor from a 100-year, 24-hour storm event plus snowmelt.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Underdrain collection sumps and downgradient monitoring wells would be used for TSF leak detection.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Water treatment would continue until metal concentrations from each source have stabilized at levels that meet water quality standards for discharge.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>A truck wash facility would include an oil/water separation system and water treatment facilities to enable reuse of the wash water.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>During mine operations, summer low flows in perennial diversion channels around the TSF impoundment and buttress (Meadow Creek), Yellow Pine pit (Hennessy Creek and East Fork SFSR tunnel), and West End pit (West End Creek) would be piped underground as a mitigation measure to maintain cold stream temperatures.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Hennessy Creek flow would be disconnected from the current unlined ditch passing alongside the Northwest Bradley dumps.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>A liner would be installed under the Meadow Creek stream/floodplain corridor to minimize water seepage into the Hangar Flats pit or the pit dewatering well system, and to avoid potential pit wall instability or loss of stream habitat as a result of stream dewatering.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>The underdrain system would convey spring and seep flows beneath both facilities to a collection sump at the buttress toe where the flows would be monitored for water quality prior to release into the stream system or capture for use in the processing circuit or treatment prior to discharge, depending on water quality.</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Crushed rock would be placed on SGP access roads as needed to provide a durable surface and limit sediment transport.</td>
<td>Water Resources, Fish, Soils</td>
</tr>
<tr>
<td>Road surfaces throughout the SGP would be stabilized and managed to minimize transport of sediment, dust, and other materials, especially near watercourses through appropriate road engineering, surface drainage, watering, and application of dust control binding agents (magnesium chloride, lignin sulfonate, etc.), roadside ditching, road-cut stabilization, road surface maintenance, appropriate speed limits, and by limiting traffic.</td>
<td>Water Resources, Fish, Soils</td>
</tr>
<tr>
<td>During operations, runoff generated from direct precipitation on the TSF would be retained in the TSF water pool for reclaim to the ore processing circuit.</td>
<td>Water Resources, Fish, Wildlife, Wetlands</td>
</tr>
<tr>
<td>Riparian fringe and floodplain wetlands would be established on the broad, gently sloping floodplains on both sides of the reclaimed stream channels.</td>
<td>Wetlands</td>
</tr>
<tr>
<td>Valley margin wetlands would only be established where there is an upgradient water source sufficient to produce enough saturation and near surface water tables for wetland conditions.</td>
<td>Wetlands</td>
</tr>
<tr>
<td>Wetland reclamation would begin after the end of mine construction, with the first reclaimed wetlands occurring in the Blowout Creek drainage. Additional reclamation would occur in and after operational year 3 and continue through operations to closure year 25.</td>
<td>Wetlands</td>
</tr>
<tr>
<td>Salvaged O and A horizon soils from wetland or hydric soils (seed bank materials over or in combination with mineral soils uplands and wetland subsoils (growth media) would be used to create wetland soil conditions.</td>
<td>Wetlands</td>
</tr>
<tr>
<td>During Burntlog Route and SGP haul road construction and use, Perpetua would install and maintain sediment control measures and devices, such as culverts, culvert inlet protection devices, ditching, silt fencing, straw wattles, straw bales, and sediment catch basins.</td>
<td>Wetlands, Fish, Wildlife</td>
</tr>
<tr>
<td>Erodible cut and fill slopes along roads would be mulched, hydro-seeded or have durable rock inlay material to minimize the potential for sediment generation.</td>
<td>Wetlands, Fish, Wildlife</td>
</tr>
<tr>
<td>During winter road maintenance, Perpetua would remove snow from the Burntlog Route and haul roads at the SGP and the temporary construction access Yellow Pine Route. Perpetua would avoid disposal of snow in riparian areas, wetlands, or areas where snowmelt might cause road damage or erosion during spring melt. Care would also be taken to dispose of collected snow, which may contain sand or gravel, in a manner that avoids impacts to nearby streams and rivers.</td>
<td>Wetlands, Fish, Wildlife</td>
</tr>
<tr>
<td>Perpetua would use coarse sand (with less than 20% fines) for winter sanding of the main access road and SGP haul roads in combination with a fine to medium gravel as needed, (approximately 1/4 - 5/8-inch sizing).</td>
<td>Wetlands, Fish, Wildlife</td>
</tr>
<tr>
<td>Perpetua would salvage and preserve the growth media and seedbank materials of wetlands and riparian areas that would be impacted by the SGP. These salvaged soils, containing native seed banks, would be used to aid in establishment of wetland and riparian vegetation in the stream and wetland reclamation areas.</td>
<td>Wetlands, Vegetation</td>
</tr>
<tr>
<td>Soil would be amended with additional compost and other sources of organic matter necessary to successfully reclaim wetlands at the SGP.</td>
<td>Wetlands, Vegetation</td>
</tr>
<tr>
<td>Perpetua would maintain a recycling program at the SGP.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Description</td>
<td>Resources Affected</td>
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<tr>
<td>In order to reduce attractants, during construction and operations, trash and other miscellaneous inert (non-hazardous) garbage would be contained in on-site wildlife-resistant containers and hauled to the Valley County waste transfer station for disposal. Used oils, solvents, grease, and antifreeze would be handled separately from normal trash and garbage. Good housekeeping practices would include minimizing loose trash, odors, and access for wildlife to trash storage or disposal areas and prompt removal of trash.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Implement an Avian Protection Plan at the SGP for transmission lines, including designing power lines and poles to minimize potential bird mortalities due to electrocution. Develop procedures for managing nests of protected species on utility structures (if nests are built).</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Construct and operate all overhead powerlines/transmission lines and related facilities in accordance with APLIC suggested practices (APLIC 2006) as described in Idaho Power’s Avian Protection Plan.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Electric power structures to serve the SGP facilities would be designed and constructed to avoid raptor perching on structures for predation purposes and minimize the risk of their being electrocuted.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would install a wildlife exclusion fence around the TSF, process facility areas, and related process ponds in order to reduce the potential for mortalities.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would plan routine inspections of TSF facilities for wildlife use. If needed, Perpetua would implement measures to remove wildlife and install additional BMPs to reduce wildlife exposure to these areas.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>If critical wildlife zones or corridors are identified, restricted or season access will be established prior to construction or expansion activities to the extent practicable. Physical barriers and/or signage will be added identifying these areas and site-specific measures will be implemented to minimize impacts.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would implement an animal trapping and relocation plan, as necessary, for nuisance species for safety of staff, visitors, and animals.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would install fences along and around the ore processing facilities, TSF, explosive storage areas, and composting/landfill, excluding pit perimeters and high walls.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would install signs of known wildlife crossing and usage areas along access and SGP haul road corridors and all active facility areas. Locations are yet to be determined but signs would be installed to state the road name and mile markers where these corridors are known to exist. These would also be referenced in the training materials.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would provide tiered training for awareness, sighting, operations and maintenance, and restoration. Cross training to include noxious weeds, maintenance needs, unsafe conditions, etc., as well as reporting mechanisms. All mine personnel and visitors would receive some level of training tiered appropriately based on where they are working, type of work activities, and reason for mine visit. Forms would be developed to document training and identify how often training needs to be refreshed. Fact sheets would be developed on known wildlife in the area including pictures, warnings, and what to do if encountered.</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Perpetua would design and manage the TSF and associated facilities to reduce wildlife attraction. These include the following:</td>
<td>Wildlife</td>
</tr>
<tr>
<td>• Surface area of the supernatant pond would be minimized to the extent practical.</td>
<td></td>
</tr>
<tr>
<td>• Install an 8-foot fence around the TSF facility to exclude wildlife from the facility.</td>
<td></td>
</tr>
<tr>
<td>• Implement an avian mortality reporting system for the TSF and contact water ponds.</td>
<td></td>
</tr>
<tr>
<td>• Use skirting to enclose open spaces as necessary beneath raised structures as practical.</td>
<td></td>
</tr>
<tr>
<td>• Follow the ICMC to avoid features possibly attractive to wildlife, as feasible.</td>
<td></td>
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</tbody>
</table>
Erosion control techniques at the SGP would include mulching, wetland sodding; planting of vegetation to stabilize slopes; and use of silt fences, biofilters, brush mats, erosion control fabric, and/or fiber rolls along temporary swales, perimeter dikes, and stream banks. In addition, to minimize human disturbance, permanent signage would be posted around the perimeter of individual project sites to prohibit unauthorized foot traffic and the use of all-terrain vehicles and motorbikes, dumping, draining, and cutting and/or removal of plant materials.

Sumps would be constructed with at least one side having a shallow grade for wildlife egress. Sumps would be backfilled and reclaimed when no longer needed for drilling.

Mine site facilities would be monitored in accordance with the draft EMMP for the presence and potential mortality of birds, mammals, reptiles, and amphibians. Sightings of rare or sensitive wildlife, along with any wildlife mortalities, would be recorded and provided in periodic reports to the Forest Service, USFWS, and IDFG.

Perpetua would provide mine personnel with mobile deterrents to avoid conflicts with wildlife – sprays, air horns, etc.

Perpetua would establish and post speed limits for the Burntlog Route, SGP haul roads, and light vehicle access roads on the SGP site. Slower speed limits would be posted at known wildlife crossings and along defined migratory corridors during migration season.

There would be no hunting or discharge of firearms during construction and operations within the SGP area. The SGP site would be posted to prohibit hunting, and employees would be prohibited from carrying firearms on the SGP.

Perpetua would employ vegetation maintenance for safety along roads, removal of hazard trees, and riparian conservation areas, etc. – coordinate such that wildlife protection and restoration are incorporated during maintenance.

### 2.4.9.1 Agency Identified Mitigation

Once environmental impacts are identified and described, mitigation measures are considered. Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the resource analysis or to reduce uncertainty regarding the forecasting of impacts into the future. If environmental impacts are inevitable, certain regulatory programs may require compensatory mitigation of the impacts. Any mitigation measures are in addition to the regulatory requirements ([Table 2.4-12](#)) and project design features ([Table 2.4-13](#)) accounted for in the impact analysis.

### 2.4.9.2 Stibnite Gold Mitigation Plan

The basis of the Perpetua’s proposed EDFs are impact avoidance and minimization up front or as part of operations. The potential impacts of the SGP remaining after applying the avoidance and minimization measures were addressed by Perpetua on a resource-basis by further avoidance, minimization, and/or compensatory mitigation described in proponent-proposed specific resource mitigation plans. The following mitigation plans have been developed for the SGP:

- Stibnite Gold EMMP (Brown and Caldwell 2021c);
Fisheries and Aquatic Resources Mitigation Plan (Brown and Caldwell, Rio Applied Science and Engineering, and BioAnalysts, Inc. 2021b);

Fishway Operations and Management Plan (Brown and Caldwell, McMillen Jacobs Associates, and BioAnalysts 2021a); and

Conceptual Stream and Wetland Mitigation Plan (Tetra Tech 2021b).

Below is a brief discussion of each of these accompanying resource-specific plans.

Following the Record of Decision, Perpetua would integrate all required Forest Service requirements and mitigation commitments into the current draft EMMP (Brown and Caldwell 2021c). This EMMP consists of a program framework and appendices containing component monitoring and management plans. Perpetua would use the EMMP to guide monitoring, document permit compliance, implement impact reduction procedures, and address adaptive management thresholds and responses where impacts and mitigation effectiveness carry substantial uncertainty.

**Fisheries and Aquatic Resources Mitigation Plan**

Perpetua’s FMP (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021a) describes the measures that Perpetua has proposed to minimize adverse impacts on fisheries and aquatic resources, with particular attention to fish species listed as threatened under the ESA: Columbia River bull trout (*Salvelinus confluentus*), Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), and Snake River Basin steelhead (*Oncorhynchus mykiss*). The FMP also addresses westslope cutthroat trout (*Oncorhynchus clarki lewisi*), considered a sensitive species by the Forest Service and IDFG, and other resident fish species.

The FMP actions would begin during construction and continue throughout mine operations and into closure and reclamation. It is focused on Chinook salmon, steelhead, bull trout, and Westslope cutthroat trout, but would also have benefits for other fish and aquatic species. The FMP includes water quality protection; fish protection, salvage, and relocation during diversions and dewatering activities; a process of protection and salvage for draining of the Yellow Pine pit; measures to avoid impacts during blasting; monitoring streamflow; restoring passage in stream channels with fish passage impediments; and monitoring of fish and aquatic biota. The FMP and its components continue to be refined in consultation with natural resource and regulatory agencies.

**Fishway Operations and Management Plan**

Perpetua has proposed a fishway for safe upstream and downstream passage of anadromous and migratory fish in the East Fork SFSR during construction and mine operations, to be part of the tunnel that diverts the East Fork SFSR around the Yellow Pine pit.

Perpetua’s FOMP (Brown and Caldwell, McMillen Jacobs Associates, and BioAnalysts, Inc. 2021a) outlines the operation of the fishway and monitoring for effective fish passage as well as an adaptive approach to provide for fish trap and haul operations as an alternative, using the same facilities. Fish protection measures for the East Fork SFSR tunnel and Yellow Pine pit dewatering are outlined as well, such as a temporary fish barrier downstream of the Yellow Pine pit during tunnel construction, carefully
sequenced dewatering of the Yellow Pine pit, and start of fishway operations (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021b).

Measures to avoid and minimize impacts to fish habitat are detailed in the FMP and FOMP (Brown and Caldwell, Rio ASE, and BioAnalysts 2021b and Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021a). As listed above, these measures including the following:

- **Water quality protection** - measures designed on managing contact and non-contact water to maintain and improve water quality while supplying sufficient water for mining and ore processing. Diversions, ditches, and other mine facilities would be lined and/or water collected and treated to protect water quality. Riparian corridors would be restored and enhanced, and certain diversions piped, to reduce stream temperatures. Water treatment would continue during both operations and the post-closure phase.

- **Fish protection, salvage, and relocation during dewatering and diversions** - measures for screening or excluding of fish from diversion channels, water withdrawals, low-flow pipes, and the Yellow Pine pit dewatering to exclude and protect fish. Work windows have been developed based on fish periodicity to account for the different life stages of the targeted fish species. During diversions and dewatering activities in fish bearing streams, fish handling and salvage protection measures have been identified to safely isolate, collect, handle, and transport the fish.

- **Trap and haul protocols at the fishway (if needed)** - the primary goal is operating and maintaining the East Fork SFSR fishway during construction and operations and later in the mine life by restoring the East Fork SFSR stream channel over the backfilled Yellow Pine pit to provide permanent, volitional upstream and downstream fish passage and access to important stream habitats of the upper East Fork SFSR and portions of Meadow Creek. If fish aren't able to use the fishway during any period, trap and haul procedures have been developed to safely collect, handle, and move fish upstream of the fishway.

- **Avoidance measures during blasting activities** - measures to largely avoid or minimize the potential effects from blasting activities using appropriate setback distances from aquatic habitats to limit blast-related air overpressure and ground vibrations to harmless levels. Other additional blasting techniques can also be used to reduce these levels, and BMPs and site-specific modification of methods can further minimize or prevent damage to fish and the aquatic environment.

- **Monitoring streamflow** - activities for maintaining, to the extent practicable, appropriate streamflows and streamflow monitoring in natural or restored channels where fish are present.

- **Stream restoration and enhancement** - design elements for stream restoration and enhancement based on natural channel design principles intended to restore permanent fish passage at Yellow Pine pit, improve fish habitat site-wide for spawning and rearing salmonids, and provide a net ecological benefit relative to current conditions.

- **Restoring passage in stream channels** - removing existing passage barriers within the mine site to allow for fish movement between streams and areas of the mine site where access is currently blocked or impeded within the SGP footprint as well as along the Burntlog Route.
• Monitoring fish and aquatic biota - provide the data necessary to evaluate how the various mitigation and protection measures are implemented, and to assess the status and trends and ongoing effectiveness. To address the potential for variances in the outcome of these measures, an adaptive management approach is outlined that would provide the mechanism to modify or adjust these measures or approaches in response to monitoring and evaluation as well as new information or technologies that may become available over the more than 20 years of construction, mining, reclamation, and restoration.

**Conceptual Stream and Wetland Mitigation Plan**

Construction of the SGP would permanently impact wetlands and other WOTUS subject to regulation under Section 404 of the CWA and requires a Department of the Army (DA) permit pursuant to Section 404. Perpetua’s Conceptual Stream and Wetland Mitigation Plan (CMP) (Tetra Tech 2021b) provides detailed descriptions of proposed restoration, establishment, enhancement, and/or preservation of aquatic resources to compensate for unavoidable impacts to WOTUS associated with activities that would be authorized by a DA permit. The CMP is conceptual until the impact analysis is finalized and the USACE has determined all mitigation requirements. The conceptual mitigation plan does demonstrate the feasibility of achieving the amount and types of mitigation to offset the impacts in a manner consistent with the 2008 Mitigation Rule. The CMP provides detailed descriptions of proposed restoration, establishment, enhancement, and/or preservation of aquatic resources to compensate for unavoidable impacts to WOTUS associated with activities that would be authorized by a DA permit (Tetra Tech 2021b).

The CMP describes mitigation to address the requirements of the USACE and EPA under the Compensatory Mitigation for Losses of Aquatic Resources under CWA Section 404 (Final Rule). The CMP includes the 12 required elements of compensatory mitigation plans (33 CFR 332.4(c)/40 CFR 230.94(c)): objectives, maintenance plan, site selection, performance standards, site protection, monitoring requirements, baseline information, long-term management plan, determination of credits, adaptive management plan, mitigation work plan, and financial assurances.

The CMP would be revised through the FEIS and with the USACE Regulatory Division—Walla Walla District, Boise Field Office, in compliance with the CWA Section 404/DA permit, stream and wetland delineations and jurisdictional determinations, development of the stream functional assessment for USACE-approved stream functional analysis, wetland and stream credits and debits determinations, and compliance with USACE’s 404(b)(1) Guidelines (40 CFR Part 230).

**2.5 Johnson Creek Route Alternative**

**2.5.1 Overview**

The Johnson Creek Route Alternative was developed to avoid or reduce certain impacts to IRAs, sensitive plant species, and wetlands. In this alternative the Burntlog Route would not be constructed and used for primary access to the SGP. The Johnson Creek Route would be used not only during initial SGP construction but would also be used during the operations and closure/reclamation phases of the SGP as well.
Development of the Johnson Creek Route would entail 216.6 acres of new cut and fill activity (including borrow sources) along existing roadways that follow segments of Johnson Creek and East Fork SFSR to make those roadways usable for mine access during its lifespan. Improvements to the Johnson Creek Route would include road widening and straightening, as well as drainage and bridge improvements to the Johnson Creek Road portion of the Johnson Creek Route. The Stibnite Road portion of the Johnson Creek Route would be improved by straightening curves, adding retaining walls, and installing culverts. It would approach the village of Yellow Pine at the junction of Johnson Creek and Stibnite roads.

This section describes only the differences from the 2021 MMP that have been incorporated into the Johnson Creek Route Alternative. Under this alternative, all of the mining, ore processing, and development rock storage activities would be the same as described in the 2021 MMP. Previously approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue as well as the ASAOC activities. The modifications in the Johnson Creek Route Alternative are listed in Table 2.5-1 and include the rationale for inclusion of each component. The proposed facilities and access roads related to this alternative are shown on Figure 2.4-1 and Figure 2.5-1. Forest Service requirements and EDFs as described in Section 2.4.9 would apply to the Johnson Creek Route Alternative.

<table>
<thead>
<tr>
<th>Phase – Component/ Subcomponent</th>
<th>Facility or Process Change</th>
<th>Rationale for Inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction/Operations/ Closure and Reclamation – Access Roads</td>
<td>The Johnson Creek Route would be the mine access route as well as the public access route.</td>
<td>Using the Johnson Creek Route for mine access could avoid impacts from construction of approximately 15 miles of new road for the Burntlog Route, including impacts to IRAs, whitebark pine (a proposed threatened plant species), and wetlands and riparian areas.</td>
</tr>
<tr>
<td>Construction/Operations/ Closure and Reclamation – Public Access</td>
<td>The Johnson Creek temporary groomed OSV Trail from Landmark to Trout Creek campground would be maintained through operations. The segment from Trout Creek to Wapiti Meadows would be closed from construction through Closure and Reclamation.</td>
<td>Keeping the temporary groomed OSV trail open during construction and operations would provide for public access each winter and connect to other OSV routes during construction and mine operation.</td>
</tr>
<tr>
<td>Operations – Utilities/Communication Towers and Repeater Sites</td>
<td>Cell tower/repeater sites construction within IRAs would be by helicopter.</td>
<td>Helicopter construction could reduce impacts to IRAs and whitebark pine (a proposed threatened plant species).</td>
</tr>
</tbody>
</table>

### 2.5.2 Land Management and Affected Areas

For the Johnson Creek Route Alternative, the estimated maximum land affected by component and land ownership is shown in Table 2.5-2.
Figure 2.5-1
Johnson Creek Route
Stibnite Gold Project
Stibnite, ID
### Table 2.5-2  Land Management and Acreage by Component for the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Component</th>
<th>Perpetua Private</th>
<th>Other Private</th>
<th>PNF</th>
<th>BNF</th>
<th>Salmon-Challis National Forest</th>
<th>BOR</th>
<th>IDL</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mine Site</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Disturbance</td>
<td>46.0</td>
<td>0</td>
<td>764.8 + 65²</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>875.8</td>
</tr>
<tr>
<td>Re-disturbance</td>
<td>454.6</td>
<td>0</td>
<td>397.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>852.2</td>
</tr>
<tr>
<td><strong>Off-site Facilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Disturbance</td>
<td>24.3</td>
<td>0</td>
<td>0</td>
<td>4.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29.1</td>
</tr>
<tr>
<td>Re-disturbance</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Access Roads</strong> (including borrow sources)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Disturbance</td>
<td>5.5</td>
<td>4.6</td>
<td>27.0</td>
<td>179.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>216.6</td>
</tr>
<tr>
<td>Re-disturbance</td>
<td>4.8</td>
<td>4.5</td>
<td>28.3</td>
<td>65.4</td>
<td>8.7</td>
<td>0</td>
<td>0</td>
<td>111.7</td>
</tr>
<tr>
<td><strong>Utilities</strong>¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Disturbance</td>
<td>2.9</td>
<td>105.9</td>
<td>61.4</td>
<td>220.8</td>
<td>0</td>
<td>3.5</td>
<td>26.0</td>
<td>420.5</td>
</tr>
<tr>
<td>Re-disturbance</td>
<td>1.0</td>
<td>174.0</td>
<td>19.4</td>
<td>349.8</td>
<td>0</td>
<td>9</td>
<td>36.1</td>
<td>589.3</td>
</tr>
<tr>
<td><strong>Disturbance Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total New Disturbance</td>
<td>78.7</td>
<td>110.5</td>
<td>853.2 + 65²</td>
<td>405.1</td>
<td>0</td>
<td>3.5</td>
<td>26.0</td>
<td>1,542.0</td>
</tr>
<tr>
<td>Total Re-disturbance</td>
<td>460.4</td>
<td>178.5</td>
<td>445.3</td>
<td>415.2</td>
<td>8.7</td>
<td>9</td>
<td>36.1</td>
<td>1,553.2</td>
</tr>
<tr>
<td>Total New and Re-Disturbance</td>
<td>539.1</td>
<td>289.0</td>
<td>1,363.5</td>
<td>820.3</td>
<td>8.7</td>
<td>12.5</td>
<td>62.1</td>
<td>3,095.2³</td>
</tr>
</tbody>
</table>

¹ Affected acres for utilities include both existing utility corridors and access routes, some of which would be upgraded, and new utility corridors and access routes.

² Approximately 65 acres associated with surface exploration pads and temporary roads (SGP component) have unknown land ownership breakdown because the exact locations of these exploration areas are not yet known; however, these are included in the PNF SGP subtotal.

³ Subtotals may not add to totals due to rounding.

⁴ Approximately 9 acres of land listed under the PNF is administered by the PNF but is within the boundary of the Salmon Challis National Forest.
2.5.3 Phasing and Timeline
The upgrades to the Johnson Creek Route, particularly along portions of the Johnson Creek Road and Stibnite Road, would take longer. Construction at the SGP could not be completed until the Johnson Creek Route is sufficiently upgraded. Accordingly, if the Johnson Creek Route Alternative were selected, the overall construction timeframe would need to be extended by a minimum of 2 years relative to the 2021 MMP in order to upgrade the Johnson Creek Route and complete construction at the SGP. The time period for SGP operations and closure and reclamation phases would be unchanged, but the start of operations would be delayed in comparison to the 2021 MMP.

2.5.4 Site Preparation, Access, Infrastructure, and Mine Operations
Site preparation, access, and infrastructure, and mining activities under the Johnson Creek Route Alternative would be the same as under the 2021 MMP except for construction/operations of the Johnson Creek Route as described below.

2.5.4.1 Access Roads
Under this Alternative, the Johnson Creek Route would be improved and used to access the SGP through construction, operations, and closure and reclamation and would be the only route of ingress and egress for the SGP. Road widening and straightening, along with drainage and bridge improvements, would be required for the Johnson Creek Road (CR 10-413) portion of the Johnson Creek Route. The Stibnite Road (FR 50412) portion would be improved by straightening curves, constructing retaining walls, and installing 182 18-inch culverts and two 60-inch culverts. Rock blasting would be required in areas to accommodate increasing the road width. Mesh and anchors, retaining walls, and concrete barriers are anticipated to be necessary due to steep rock canyon topography to mitigate safety hazards. The Johnson Creek Route would take approximately twice as long to construct as the Burntlog Route as the level and pace of construction would be limited by space constraints and the need to maintain some level of access through the construction zone to allow for passage of equipment, materials, and laborers to the mine site. It would also require drilling and blasting of rock overhands. Approximately 1 mile of road through the village of Yellow Pine would be paved.

Construction of facilities at the SGP would be completed following upgrades to the Johnson Creek Route. Construction of improvements to the Johnson Creek Route would require approximately 4 years due to the nature of the topography and terrain and the inability to do construction from both ends simultaneously.

During construction, Johnson Creek Road would require periodic temporary road closures. To complete upgrades to the Stibnite Road, daily road closures would be required from 10 a.m. to 4 p.m. during a 3-year construction period to conduct the cut and fill activities required to straighten curves and install retaining walls.

2.5.4.2 Public Access
During construction and mine operations, the public would share the Johnson Creek Route with mine related traffic transporting personnel, materials, and supplies to the SGP. The access route around the Yellow Pine pit would provide public access, employee access, and delivery access of supplies and
equipment to the processing, warehouse, worker housing facility, and administration areas. Therefore, this road would need to accommodate heavy vehicles in addition to light vehicles.

This alternative would include constructing a road through the SGP to accommodate public access and delivery of mining materials and supplies. The road would be constructed around the Yellow Pine pit and into the SGP as shown on Figure 2.4-2. South of the Yellow Pine pit, the through-site public access road would follow an alignment similar to the 2021 MMP through-site access road. As such, it would pass under the mine haul road and continue southward, and southwest of the ore processing area, connecting with the Thunder Mountain Road and continuing toward the Worker Housing Facility before exiting the site area to the southeast. This portion of the access road would not be plowed in the winter per current county maintenance standards and would not be winter-season accessible to the public.

Under the Johnson Creek Route Alternative, the Johnson Creek groomed OSV trail would be on the west side of Johnson Creek Road from Landmark to Trout Creek campground during operations as described for 2021 MMP but the segment along Johnson Creek Road from Trout Creek campground to Wapiti Meadows would be closed from construction through closure and reclamation. Other OSV trails as described in Section 2.4.4.4 would be the same as the 2021 MMP.

2.5.4.3 Utilities

The transmission line upgrade and new construction would be the same as under the 2021 MMP. However, the two VHF repeater sites would be located along Johnson Creek Road; one VHF repeater site would be located off FR 410 at Deadhorse point and the other on the north end at Golden Gate Hill. Helicopters would be used to construct and maintain high frequency radio repeater and cell tower sites located within IRAs managed for Backcountry/Restoration. Other utilities would be the same as 2021 MMP.

2.5.4.4 Off-site Facilities

Under the Johnson Creek Route Alternative, the access road maintenance facility would be shifted to the west and located on approximately 3.5 acres of NFS land near the intersection of Warm Lake and Johnson Creek roads, it would be accessed via Warm Lake Road. It would be called the Landmark Maintenance Facility and would include the same components as displayed in Figure 2.4-8 for the Burntlog Maintenance Facility described in the 2021 MMP.

2.5.5 Closure and Reclamation

The improvements to the Johnson Creek Route would remain after mine operations end. Johnson Creek Road and Stibnite Road would not be returned to the pre-mine width. Rock cuts, 9-foot-high retaining walls, 182 18-inch culverts, and the two 60-inch culverts would remain.

Post-closure public access through the SGP would be the same as 2021 MMP (Figure 2.4-18).
2.6 Alternatives Considered but Eliminated from Further Detailed Study

Federal agencies are required under NEPA to rigorously explore and objectively evaluate a reasonable range of alternatives that could both meet the project purpose and need and potentially reduce environmental impacts from the project. The alternatives development and evaluation process also should briefly discuss the reasons for any alternatives eliminated from further analysis and thus, not developed in detail (40 CFR 1502.14). FSH 1909.15, Chapter 10, Section 14.4 provides further guidance on the evaluation and elimination of alternatives: “Alternatives not considered in detail may include, but are not limited to, those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm.”

The alternatives development process for the SGP was conducted in accordance with the Council on Environmental Quality (CEQ) and Forest Service regulations (40 CFR 1502.14 and 36 CFR 220.5, respectively) and Forest Service alternatives development guidance.

The component options that comprise the alternatives evaluated by the Forest Service and the cooperating agencies were focused on addressing one or more of the significant issues listed in Section 1.10, Issues.

Potential alternatives and component/subcomponent options were screened based upon four criteria:

- Does the alternative, including a combination of component options, meet the purpose and need of the project?
- Would the alternative or component option potentially reduce environmental effects to at least one resource?
- Is the alternative or component option technically feasible?
- Is the alternative or component option economically feasible?

If an alternative or component option would not have the potential to provide at least one environmental advantage as compared to the actions described in the 2021 MMP, it was eliminated from further study.

It should be noted that the emphasis for alternatives development is whether the alternative is reasonable, rather than whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant (46 FR 18026). Additional detail of the alternative development process and elimination of various options for detailed analysis is available in the Alternatives Development Report (AECOM 2020a).

2.6.1 Mining Method

Three potential types of mining method alternatives were examined and are detailed below.
**2.6.1.1 Underground Mining**

Under an underground mining alternative, ores from the Hangar Flats, Yellow Pine, and West End deposits would be mined via underground mining methods instead of open pits. Development rock generated from mining would be utilized to backfill completed underground workings for geotechnical stability or placed in surface facilities. The potential environmental benefit would be less surface disturbance for the mine operation.

In aggregate, grades for these three deposits above a 0.48 grams per ton (g/t) gold cut-off grade averaged 1.43 g/t gold, 1.91 g/t silver, and 0.064 percent antimony (M3 2021). Typical economic cutoff grades for underground mine operations are approximately 5 g/t gold. With gold grades well below typical economic cutoff grade, underground mining would not meet the purpose and need for the SGP to produce saleable minerals because doing so would not be an economic endeavor. Associated silver and antimony grades are not sufficient to offset the lower gold grade or to merit underground mining for production of those minerals.

In addition, underground mining development rock production would be insufficient to meet the construction needs for the SGP such as the TSF Embankment and Buttress. Therefore, this alternative would not completely remove the need for surface disturbance associated with mining the necessary construction materials. In addition, less development rock production could eliminate the currently proposed backfill and re-establishment of the East Fork SFSR across the Yellow Pine pit.

**2.6.1.2 West End Pit Backfill**

This alternative would involve placement of development rock in the West End pit during reclamation. Backfill of the West End pit would reduce or eliminate the post-reclamation West End pit lake and the amount of development rock placed in the TSF Buttress, Hangar Flats pit backfill, and Yellow Pine pit backfill.

Currently proposed project phasing enables backfilling of the Hangar Flats and Yellow Pine pits with development rock from the West End pit during operations. However, as the final pit is mined, backfill of the West End Pit could not be conducted safely until mining in that pit ceased. This would require re-handling and haulage of tens of millions of tons of development rock that would need to be placed temporarily in other locations back to the West End pit. The rehandling of development rock would increase the duration of mine operations to rehandle the development rock into the West End pit after mining in the pit ceased. This would increase mining equipment traffic and emissions over the life of the SGP.

Development rock from the West End pit is currently scheduled to be incorporated into the TSF Embankment and Buttress, and the backfills of the Hangar Flats, Midnight, and Yellow Pine pits. Rehandling the development rock required to backfill the West End pit would necessarily change the currently proposed final configuration of one or more of these other sites, potentially including reductions to the currently proposed pit backfills. Therefore, this alternative does not represent a net reduction of environmental effects. In addition, the operation costs associated with rehandling a large amount of development rock would negatively affect the economic feasibility of the SGP.
2.6.1.3 Electric Mining Equipment

Certain mining equipment, such as large shovels, drills, and haul trucks, can be powered with electricity and have been in some of the world's larger mine operations for years. There is a trend toward powering a wider variety of mining equipment with electricity. This reduces the need for diesel fuel handling and combustion at mine sites, reducing local air emissions. However, mining equipment of the type and moderate size proposed for use at the SGP is still typically powered by diesel engines, and this is what Perpetua has proposed for the SGP.

To constrain or dictate the selection of mine equipment is outside the purview of the PNF regulatory approval. Air impact analysis for the SGP has shown that regulatory limits related to the air emissions from the mining equipment fleet would be complied with so major reductions in equipment emissions is not required. Electrifying the proposed mining equipment would not reduce environmental impacts associated with ground disturbance, water management, geological hazards, hazardous materials, and associated resources.

2.6.2 Processing Method

Two potential types of processing method alternatives were examined and are discussed further below.

2.6.2.1 Off-Site Gold Processing

Under this alternative, raw ore would be processed off-site and would reduce the amount of reagents transported and used at the SGP, and the number of employees traveling to the site. It would also eliminate the need to store mill tailings at the SGP site. Transporting approximately 22,000 tons per day by trucks to an offsite mill would require approximately 550 round trips daily during the 15 years of mine operations. This would greatly increase the air emissions and transportation impacts of the SGP and dramatically increase operational costs. The main problem with this alternative is that there currently is no commercial milling operation in the U.S. West that could economically process the SGP ore. So, a new mill, with all the same associated environmental impacts as the proposed SGP on-site mill would need to be constructed.

In the absence of on-site ore processing, the environmental benefits of legacy material removal (e.g., SODA) to allow for construction of the on-site TSF would also not be realized.

2.6.2.2 Dry Stack Tailings

The proposed tailings management would involve deposition of a tailings slurry in the proposed TSF where the contained solids would settle out and the accumulated water would be recycled to the mill process. This type of tailings management requires careful attention to the handling of the water balance in the tailings system and the geotechnical stability of the embankment forming the TSF. There is also the potential for subsurface seepage of tailings water out of the bottom of the TSF. Alternative methods for handling tailings include: 1) dewatering the tailings mechanically and transporting the "dry" tailings solids to the TSF, and 2) partially dewatering the tailings to produce a paste which is then pumped to the TSF. These approaches eliminate or greatly reduce the amount of tailings water stored in the TSF reducing the concerns for water balance, subsurface leakage, and geotechnical stability of the tailings embankment.
The use of the dry stack method of tailings disposal was evaluated and determined to be technically and economically infeasible. The ore processing rate and tailings grind size are not conducive to the generation of dry tailings. In addition, although the "dry" tailings could be handled as a solid waste, they would still contain appreciable moisture and seasonal high precipitation and freezing temperatures could create day to day handling problems.

Paste tailings disposal was also evaluated and determined to be technically feasible but not economically feasible and did not offer environmental advantages over other action alternatives. Additional information on the evaluation of tailings disposal methodologies is included in the Technical Memorandum titled “Review of Midas Gold Tailing Technology for the Stibnite Gold Project and Alternatives, Valley County, Idaho” (AECOM 2020b).

2.6.3 Facility Locations

Alternative locations for four project facilities were examined and discussed further below.

2.6.3.1 Tailings Storage Facility

Several options were considered for the TSF component. These included:

- Construction of the TSF in a series of smaller facilities separated by TSF embankments in a phased manner;
- Construction of the TSF within the East Fork SFSR valley upstream of Fern Creek; and
- Construction of the TSF in the East Fork SFSR east of Meadow Creek in areas previously undisturbed by mining.

The TSF location in the East Fork SFSR east of Meadow Creek was fully analyzed as Alternative 3 in the DEIS (Forest Service 2020a). There were no environmental benefits noted for this location. Therefore, detailed analysis of this location was not retained for the SDEIS.

The construction and use of multiple, phased TSF locations would increase the disturbance footprint, triple the number of TSF embankments, and the quantity of embankment construction material required for tailings storage. Therefore, there would be an increase of impacts to soils, water resources, and aquatic resources under this scenario, resulting in no reduction to environmental effects.

The TSF location within the East Fork SFSR upstream of Fern Creek would not realize the benefit of legacy material removal from Meadow Creek and would increase effects on water resources plus fish and wildlife habitats by increasing ground disturbance (approximately 510 acres).

2.6.3.2 Power Transmission Line Route

Two potential transmission line route alternatives were considered:

- Locating the transmission line segment from the Johnson Creek substation to the mine on the north side of the TSF, following a former jeep trail alignment between the Horse Heaven and Meadow Creek IRAs; and
Extending the existing 138-kV transmission line from the Yellow Pine substation to FR 458 east of Golden Hill road and then along Stibnite Road (FR 50412) to the SGP.

These route options did not reduce environmental effects of the SGP as they would require additional disturbance for access and maintenance to install longer routes; further, topographical constraints could require use of self-supported steel structures rather than conventional wood poles. In particular, the Horse Heaven to Meadow Creek route was analyzed as part of Alternative 3 in the DEIS (Forest Service 2020a). Based on that analysis indicating it would have greater impacts on IRAs, riparian and wetlands habitat, and associated wildlife, it was not retained for detailed analysis in this SDEIS.

In addition to environmental effects, the Stibnite Road route has relatively more exposure to avalanche hazards.

### 2.6.3.3 Worker Housing Facility

Under this alternative, the worker housing facility would be located within the mine area. Architectural and engineering controls would be utilized to reduce interior noise along with sound control building materials.

This location was evaluated under Alternative 3 of the DEIS (Forest Service 2020a). There was no reduction in environmental effects associated with this location plus it moved the housing facility into an area of greater geological hazard risk. Therefore, it was not retained for detailed analysis in this SDEIS.

### 2.6.4 Transportation and Access Road Alternatives

Six potential transportation and access road component options were examined and are discussed below.

#### 2.6.4.1 South Fork Route

Under this alternative, the South Fork Route would serve as the main access road, utilizing Warm Lake Road, South Fork Road, East Fork SF SR Road, and then Stibnite Road, for SGP access. This route was determined to have greater environmental impacts and greater safety issues than other alternatives; therefore, it was not technically feasible, did not reduce environmental effects, and was not carried forward for further evaluation.

#### 2.6.4.2 Lick Creek Route

Under this alternative, the Lick Creek Route would serve as the main access road, utilizing Lick Creek Road from SH 55 to East Fork SFSR Road, and then Stibnite Road, for SGP access. This route met the purpose and need; however, it would not lessen potential environmental impacts and posed greater safety issues than other alternatives. This route was determined to not be technically feasible, did not reduce environmental effects, and was not carried forward for further evaluation.

Other alternative road segments were also considered that could be combined with others to provide access to the SGP including Cabin/Trout Creek Road, Old Thunder Mountain Road, and Riordan Creek Road. These segments were eliminated because they did not lessen potential environmental impacts, posed greater safety issues (Old Thunder Mountain Road), and were economically not feasible.
2.6.4.3 Convoy Mine Traffic

Under this alternative, all mine workforce, supply and haulage, and miscellaneous traffic would be transported in convoys (grouping deliveries together) of approximately six vehicles during construction and operations. Convoys would be used to minimize disruption to the public and would be used Monday through Friday from approximately 6:00 a.m. to 8:00 p.m. Convoys could improve public safety and reduce the risk of traffic accidents.

This alternative would not reduce the overall volume of traffic to and from the SGP. Recreational or public vehicles using the same route as the convoys would still encounter mine related traffic. Oncoming vehicles would have to wait for the convoy to pass before entering the roadway, while vehicles behind the convoy would be required to follow along until a safe (longer) place to pass was available. Designated pullouts or turnouts for the convoy to allow safe passage of following vehicles would help mitigate traffic related concerns. However, because convoys would not reduce the volume of traffic, there would be no discernable environmental advantages. Additionally, coordinating arrival and delivery times of all vendors traveling to the SGP could prove technically infeasible. Therefore, this alternative was not carried forward for further evaluation.

2.6.4.4 Public Parking Lots at Project Components

This alternative would involve development of public parking lots for recreational use at the worker housing facility and/or Knox Ranch near Cascade, Idaho. It would also include accommodations for snowmobile trail grooming by either constructing a storage shed for grooming equipment at the parking lot or hauling grooming equipment from Cascade to the lot.

Parking lots in mine areas increase the potential impacts associated with public safety and geological hazards. They also lead to potential inconsistencies between the regulatory agencies’ independent responsibilities to regulate mining and public access. Therefore, they were not evaluated further.

2.6.4.5 No Temporary OSV Trail

In this alternative, the proposed temporary OSV trail would not be developed. Instead, wintertime traffic would be diverted to the South Fork Route. The rationale for eliminating the South Fork Route from further evaluation is described in Section 2.6.4.1. Without diversion of wintertime traffic, electing to not develop a temporary trail would increase SGP impacts to recreational use.

2.6.5 Water Management Alternatives

Four potential component options for water management were examined and are discussed below.

2.6.5.1 Dry Mining and Processing

The ability to mine and process ore under dry conditions was examined and determined to be technically infeasible. However, pit dewatering is necessary to meet the purpose and need for the SGP because the targeted minerals reside primarily below the water table. There are no technically feasible dry processing methods for the beneficiation of gold and silver from ores exhibiting the mineralization type present at the SGP.
2.6.5.2 West End Pit Drainage

For this alternative, an engineered drain utilizing a head gate to a pipe would be installed at the base of the West End pit to convey water from the pit bottom to West End Creek. This would prevent the formation of a pit lake in West End pit but would not reduce effects on water chemistry in the pit because groundwater and meteoric water entering the pit would still interact with the exposed pit walls. In addition, long-term operation and maintenance of the gate and pipe would be susceptible to technical feasibility issues similar to the historical mine diversion and drainage features at the SGP.

2.6.5.3 Modified Blowout Creek Restoration

Under this modification, a French drain design would not be used to control water and sediment conveyance at the Blowout Creek drainage. Instead, the drainage slopes would be graded to improve their hydrologic functioning condition. This alternative was not evaluated further because it did not result in a reduction of environmental impacts from the 2021 MMP.

2.6.5.4 Yellow Pine Pit Diversion without Fish Passage

For this alternative, the diversion of the East Fork SFSR around the Yellow Pine pit area would not accommodate fish passage. This alternative was examined as part of Alternative 3 in the DEIS (Forest Service 2020a). It is not evaluated further because it did not result in a reduction of environmental impacts.

2.7 Agency Preferred Alternative

Following their review of the environmental impacts as discussed in the SDEIS, the Forest Service has identified the 2021 MMP as their Preferred Alternative for the SGP because this alternative:

- Incorporates water management and closure activities to reduce the duration of long-term water treatment requirements.

- Incorporates measures to manage stream temperatures.

- Reduces the geotechnical stability, hazardous materials transport, and public health and safety transportation risks during operations (2021 MMP: 26 landslides/rockfalls and 38 avalanche paths versus Johnson Creek Route Alternative: 45 landslides/rockfalls and 94 avalanche paths).

- Reduces potential for spill contamination, sedimentation, and turbidity to streams during operations (2021 MMP: 9 miles of travelway within 0.5 miles of streams, 37 stream crossings, 1.6 miles of travelway within 100 feet of streams versus Johnson Creek Route Alternative: 27 miles of travelway within 0.5 mile of streams, 43 stream crossings, and 6.5 miles of travelway within 100 feet of streams).

- Reduces acres of riparian area lost within off-site focus area (2021 MMP: 299.5 acres versus Johnson Creek Route Alternative: 352.6 acres).
• Reduces the volume of timber resources removed (2021 MMP: 595 acres versus Johnson Creek Route Alternative: 733 acres), as well as acres of timberland permanently converted to non-productive land use (2021 MMP: 66 acres versus Johnson Creek Route Alternative: 282 acres).

• Reduces public safety risks and potential accidents during operations (Johnson Creek Route Alternative has steeper topography and terrain requiring wider roads, more cut/fill sections and more switchbacks; traffic including heavy equipment would be routed through the village of Yellow Pine for the duration of the SGP; general public would utilize same roads as large mining equipment).

• Reduces potential impacts such as access to tribal fisheries restoration activities along Johnson Creek Road during operations.

The Agency Preferred Alternative would reasonably accomplish the purpose and need for the federal action, while giving consideration to environmental, economic, and technical factors.

2.8 Summary Comparison of Alternatives

Table 2.8-1 provides a tabular summary and comparison of impacts from the components of the No Action Alternative, the 2021 MMP, and the Johnson Creek Route Alternative. A comparison of the 2021 MMP to earlier proposed plans can be found in Perpetua 2021a (Table A-1).
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### Table 2.8-1 Alternative Comparison and Impact Summary

<table>
<thead>
<tr>
<th>Issue</th>
<th>Indicator</th>
<th>Baseline Conditions</th>
<th>No Action Alternative</th>
<th>2021 MMP</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Minerals present at the site are economically valuable</td>
<td>Amount of ore extracted</td>
<td>132.3 M tons of measured and indicated ore (including tailings)</td>
<td>Same as Baseline Condition.</td>
<td>112 M tons of ore would be mined. About 3.2 M tons of historical Bradley tailings would also be removed and reprocessed. Total ore processed would be 115.2 M tons.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Minerals contribution to national economy</td>
<td>Depletion of mineral resources</td>
<td>Mineral reserve is approximately 4.819 M oz ounces of gold, 6.431 M oz of silver, and 148.686 M lbs. of antimony</td>
<td>Same as Baseline Condition.</td>
<td>Recover, over 15 years of mill production, 4.238 M oz of gold, 1.710 M oz of silver, and 115.342 M lbs. of antimony.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Change in topography</td>
<td>Alteration of topography</td>
<td>Legacy pit highwalls undisturbed valley bottom</td>
<td>Same as Baseline Condition.</td>
<td>Three new open pits, backfilled but highwalls remaining, TSF and TSF buttress in valley bottom, road cuts/fills along access roads.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Geotechnical stability</td>
<td>Stability of selected locations</td>
<td>Rockfalls, landslides and avalanche paths</td>
<td>Same as Baseline Condition.</td>
<td>26 landslides and rockfalls along access road route 38 avalanche paths along access road route. 45 landslides and rockfalls along access road route.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Geotechnical stability</td>
<td>Long-term geologic/geotechnical stability of TSF</td>
<td>No TSF present.</td>
<td>Same as Baseline Condition.</td>
<td>Underlying bedrock is more than sufficiently competent to support the TSF (rock types consist of quartz monzonite, diorite, granite and rhyolite). Designed to meet regulatory stability criteria even in the absence of the downstream buttressing provided by the TSF Buttress.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Geographical extent of pollutant concentrations and deposition.</td>
<td>No SGP air emissions to affect existing conditions</td>
<td>Same as Baseline Condition.</td>
<td>SGP air quality impacts would be less than the National Ambient Air Quality Standards (NAAQS) because emissions are below deposition significance levels.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Type and volume of air pollutants emitted, including haze precursors, airborne dust, and HAPs.</td>
<td>No SGP air emissions to affect existing conditions</td>
<td>Same as Baseline Condition.</td>
<td>Emission inventories for construction through LOM Year 18 indicated that the peak year for aggregated pollutant emissions would be LOM Year 10, also the peak year for mine throughput.</td>
<td>Same as 2021 MMP, except for those changes due to emissions location due to use of Johnson Creek Route (i.e., different haul routes).</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Criteria air pollutant ambient concentrations outside the Operations Area Boundary anywhere the public is allowed unrestricted access.</td>
<td>Current air quality in the SGP area is good, and in attainment with air quality standards.</td>
<td>Same as Baseline Condition.</td>
<td>SGP air quality impacts would be less than NAAQS because and below deposition significance levels.</td>
<td>Same as 2021 MMP, except that locations of off-site concentrations may differ due use of Johnson Creek Route rather than Burntlog Route.</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Comparison of modeled concentrations to Class I and Class II increments.</td>
<td>Current air quality in the SGP area is good, and in attainment with air quality standards.</td>
<td>Same as Baseline Condition.</td>
<td>SGP air quality impacts would be less than the Class I and Class II increments.</td>
<td>Same as 2021 MMP, except that magnitude and locations of off-site concentrations may differ due use of Johnson Creek Route rather than Burntlog route.</td>
</tr>
<tr>
<td>Air Quality</td>
<td>HAPs (including Hg emissions and Hg deposition).</td>
<td>Background concentrations and deposition occurs due to transport from distant industrial and urban sources.</td>
<td>Same as Baseline Condition.</td>
<td>Emissions HAPs, HCN, and Hg estimated for peak mine production year. Deposition of Hg limited in extent and well below health-based thresholds. HAP emission impacts are less than state acceptable ambient non-carcinogenic concentrations/acceptable ambient carcinogenic concentrations (AAC/AACCs).</td>
<td>Same as 2021 MMP.</td>
</tr>
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<tr>
<td>The SGP may affect air quality characteristics and resources</td>
<td>Deposition impacts from nitrogen and sulfur compounds at Class I areas and specified Class II wilderness areas.</td>
<td>Existing deposition rates occur due to transport from distant industrial and urban sources.</td>
<td>Same as Baseline Condition.</td>
<td>Modeling of N and S deposition in areas of concern show that deposition rates are below acceptable levels for Class I areas.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>The SGP may affect air quality characteristics and resources</td>
<td>Near-field plume blight and far-field regional haze impacts in protected areas.</td>
<td>No SGP sources to create visible near-field plumes. Existing regional haze occurs due to transport from distant industrial and urban sources.</td>
<td>Same as Baseline Condition.</td>
<td>SGP sources may cause visible plumes at the closest Class II wilderness area (FCRNRW) for a small fraction of daylight hours (~0.02 hours). Far-field modeling of regional haze shows contribution from SGP sources would be below federal significance level.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>The SGP activities could contribute to factors that influence climate change.</td>
<td>GHG emissions from SGP activities (construction, operations, and closure and reclamation), expressed as MT of CO2e of GHGs.</td>
<td>No emissions.</td>
<td>Same as Baseline Condition.</td>
<td>Maximum LOM 3 200,671 MT (221,201 short tons/yr.) of CO2e of total annual GHG emissions.</td>
<td>Small incremental differences from the 2021 MMP. GHG emissions would be reduced because the Burntlog Route would not be constructed; however, the construction activities required on the Johnson Creek Route would likely offset the decrease and would likely end up very similar.</td>
</tr>
<tr>
<td>Changing climatic conditions, in synergy with the SGP (including construction, operations, and closure and reclamation), could impact the physical, biological, and social resources.</td>
<td>Changes in hydrologic patterns (drought, precipitation variability and seasonality). Changes in temperature (extreme heat/cold, or overall change in annual or seasonal temperatures). Changes in extreme weather events (flash flooding, wildfires, severe storms).</td>
<td>Current trends show variable annual average precipitation and drought patterns, decreases in snowpack, and decreases in streamflow. Current trends show increases in annual average temperature and more frequent temperature extremes. Current trends show increased frequency and intensity of extreme weather events.</td>
<td>Same as Baseline Condition.</td>
<td>Changing climatic conditions would be expected to result in decreased soil moisture and quality; air quality; annual streamflow; groundwater recharge; water quality; increased surface water temperatures; increased spread of insects and diseases; changes in the timing, duration, and severity of fire seasons; and habitat loss and fragmentation.</td>
<td>Same as 2021 MMP, except the severity of climate change impacts may be reduced for surface water (quality and quantity), wetlands and riparian resources, vegetation (including general vegetation communities, botanical resources, and non-native plants), fish resources and fish habitat, wildlife and wildlife habitat, and special designations.</td>
</tr>
<tr>
<td>The SGP may result in long-term adverse impacts to soil resources.</td>
<td>Acres and proportion of TSRC activity area that are converted from a productive site to a non-productive site (TSRC, as defined in the Payette Forest Plan). Acres and proportion of DD activity area that have altered soil characteristics resulting in loss of productivity and altered soil-hydrologic conditions.</td>
<td>TSRC Existing conditions of TSRC in the PNF activity area is approximately 259 acres within the combined subwatershed activity areas (7,468 acres), or roughly 3 percent. Existing conditions of TSRC in the BNF activity area is approximately 904 acres of the combined subwatershed activity areas (76,196 acres), or roughly 1 percent. DD Existing conditions of DD within the transmission line ROW is estimated at 8 percent.</td>
<td>Same as Baseline Condition.</td>
<td>TSRC PNF Activity Area The magnitude of impacts to soil resources within the PNF activity area includes excavation, grading, or filling of up to 1,457 acres (approximately 120 acres of which are already disturbed to some degree from historical mining activities or other TSRC). This results in a net increase of TSRC in the PNF activity area of approximately 1,198 acres (from an existing 259 acres to 1,457 acres). Overall TSRC under 2021 MMP would increase from approximately 3 percent to 17 percent of the PNF activity area. TSRC BNF Activity Area The magnitude of impacts to soil resources within the BNF activity area includes excavation, grading, or filling of up to 902 acres (approximately 66 acres of which are already disturbed due to overlap with and use of existing dedicated roadways, etc.) This results in a net increase of TSRC in the BNF activity area of approximately 836 acres (from 904 acres to 1,740 acres). Overall TSRC under 2021 MMP would increase to 2 percent of the BNF activity area.</td>
<td>TSRC PNF Activity Area The magnitude of impacts to soil resources within the PNF activity area includes excavation, grading, or filling of up to 1,457 acres (approximately 120 acres of which are already disturbed to some degree from historical mining activities or other TSRC). This results in a net increase of TSRC in the PNF activity area of approximately 1,198 acres (from an existing 259 acres to 1,457 acres). Overall TSRC under 2021 MMP would increase from approximately 3 percent to 17 percent of the PNF activity area.</td>
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<tr>
<td>DD</td>
<td>The DD activity area is the area within the transmission line ROW that would be subject to vegetation clearing only and is estimated at up to 500 acres. The magnitude of impacts from vegetation clearing potentially include detrimental soil displacement, compaction and puddling on up to a conservatively estimated 75 acres (15 percent) within the ROW.</td>
<td>Same as Baseline Condition.</td>
<td>A total of 1,658,000 BCY of GM and seed bank material (SBM) would be required to meet the specified reclamation areas and GM/SBM thicknesses. Soil salvage would generate approximately 860,000 BCY of GM/SBM. The 797,702 BCY deficit of RCM would be generated from unsuitable unconsolidated till mined from the Yellow Pine Pit plus other cover material at the project site and amended for suitability. The quality of RCM would vary based on its source, the best material coming largely from the organic and alluvial soils of the Meadow Creek valley. Most of this material would be used for GM and SBM for wetland restoration. GM used for upland reclamation sites would mostly come from relatively poor upland soils. Overall, the majority of GM used would rate as poor or fair (per suitability criteria), due primarily to texture and coarse fragment content (Tetra Tech 2019a, 2021b). Additionally, the naturally high background levels of trace metals at the SGP represents a challenge for reclamation-related revegetation efforts. Perpetua’s proposed 3,000-ppm arsenic limit for suitable root zone material is high; however, the Forest Service also would require limits on the GM (that would overlay the root zone material) for arsenic, mercury, and antimony, and would require a screening of soils as well as laboratory testing.</td>
<td>Essentially the same as the 2021 MMP for the mining area, with disturbance footprint-related adjustments for required GM/SBM and GM deficit. No potential Burntlog Route surplus salvage to compensate for the GM deficit at the mine site.</td>
<td></td>
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<tr>
<td>BNF Activity Area</td>
<td>The magnitude of impacts to soil resources within the BNF activity area includes excavation, grading, or filling of 321 acres (approximately 133 acres of which are already disturbed due to overlap with and use of existing dedicated roadways, etc.) This results in a net increase of TSRC in the BNF activity area of approximately 188 acres (from 904 acres to 1,092 acres). Overall TSRC under the Johnson Creek Route Alternative would increase to 2 percent of the BNF activity area.</td>
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<tr>
<td>DD</td>
<td>Essentially the same as the 2021 MMP (15 percent of ROW).</td>
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<tr>
<td>Available RCM may not be of sufficient quantity or quality to achieve reclamation objectives of returning disturbed areas to productive conditions that sustain long-term wildlife, fisheries, land, and water resources.</td>
<td>Volume of RCM available for reclamation compared to expected demand to achieve reclamation objectives. Quality and suitability of RCM available for reclamation.</td>
<td>RCM availability is based on soil type, subsurface and bedrock character and topography in previously undisturbed areas within the SGP area.</td>
<td>Same as Baseline Condition.</td>
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<tr>
<td>Noise</td>
<td>The SGP may cause disturbance to NSRs (such as occupied residences and campgrounds).</td>
<td>Area affected by noise that exceeds Outdoor Ambient Sound Level and 55 dBA.</td>
<td>Baseline ambient sound levels vary by location and range between 34 and 64 dBA, L_{eq} over the 12 identified NSRs as summarized Table 3.6-2.</td>
<td>Same as Baseline Condition.</td>
<td></td>
</tr>
</tbody>
</table>

**Noise**

- Site 2 would have temporary impacts while transmission line work is within approximately 800-850 feet. There are no other source impacts at Site 2 due to distance.
- Construction: Temporary impacts at Site 2, Site 9, Site 10 and Site 11 while transmission line work is within approximately 800-850 feet. Site 10 and some parts of the FCRNRW
Issue Indicator Baseline Conditions No Action Alternative 2021 MMP Johnson Creek Route Alternative

Site 3 would have short-term, negligible, localized impact during construction, mainly caused by the Burntlog Route construction.
Site 5 would have a temporary increase in noise levels due to the Burntlog Route access road construction. Burntlog Maintenance facilities construction, and SGP-related traffic on Johnson Creek Route would cause the majority of noise impacts. The transmission line work would cause temporary impacts within approximately 800-850 feet.
Sites 6, 7, and 8 would have short-term, negligible, localized impacts caused by the transmission line upgrades.
Site 9 would have temporary impacts during transmission line is occurring. Include the utility access roads and facility construction at SGLF.
Site 10 would have short-term, negligible, localized impact caused mainly by SGP-related traffic on Johnson Creek Route access road.
Site 11 would have temporary impacts during the construction of the transmission line upgrades, including the utility access roads in the immediate vicinity, and SGP-related traffic on Johnson Creek Road.
Site 12 would have the highest impacts during the first year of Burntlog Route construction. The impacts at Site 12 would be short-term, negligible to minor, and localized.

Operations:
SGP-related traffic during operations would cause minor, long-term, and localized impacts from SH 55 to SGLF, and from SGLF to SGP or Burntlog Route. The borrow area impacts would be negligible to minor, long-term, but intermittent, and localized.
Utilities and off-site facilities would cause minor, long-term, and localized impacts.
Site 2 would have no impact.
Site 3 would have negligible impacts during Burntlog Route access road maintenance.
Site 5 would have negligible to minor, long-term impacts during road maintenance activities.
Sites 6, 7, 8, 9, 10, 11, and 12 would have negligible impacts during operations, with and without blasting.
Site 7 would have an increased impact during winter maintenance on Burntlog Route, remaining below 55 dBA. Substation noise is the only SGP-related noise impact at Sites 8, 9, 10, and 11.
Closure:
Temporary impacts at Site 5 while access road decommissioning work is within approximately 0.5 miles. No decommissioning-related noise of the transmission line into the SGP.

Site 3 would have negligible impacts during Burntlog Route access road maintenance.
Site 5 would have negligible to minor, long-term impacts during road maintenance activity due to use of Johnson Creek Route. There would be increased noise at Site 5 due to location of maintenance facility at Landmark.
Closure:
No impacts above recommended noise level. Johnson Creek Route would not be decommissioned and would remain as built.
### Hazardous Materials

<table>
<thead>
<tr>
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<tr>
<td>The SGP may cause accidental release of hazardous materials or wastes, including milling reagents and reaction products, during the transport, use, storage, and disposal of materials.</td>
<td>Volumes and types of hazardous materials and hazardous wastes transported, used, and stored during site operation.</td>
<td>Petroleum products are currently stored at existing facilities for the exploration activities. Fuel storage areas are present in 16 locations with capacities from 55 to 10,000 gallons.</td>
<td>Same as Baseline Condition.</td>
<td>Hazardous materials and petroleum products storage would be stored at the following locations: SGLF, Burntlog Maintenance Facility, Worker Housing Facility, and Fuel and Explosive Storage. Approximate hazardous materials annual use and transport volumes would include: explosives (7,400 tons), fuels and lubricants (6.6 million gallons); antifreeze (40,000 gallons); propane (2 million gallons); antimony concentrate (365 to 730 truckloads); sodium cyanide (4,000 tons); copper sulfate (1,250 tons); nitric acid (65,000 gallons); sulfuric acid (12,000 gallons) solvents (1,000 gallons) along with other chemicals as listed in Table 4.7-1.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Practices for storage and use on site including primary and secondary containment types and volumes and material handling practices.</td>
<td>Hazardous materials are used and stored on site in accordance with applicable regulations including secondary containment for fuels and other hazardous materials. Perpetua has developed documents for use and storage including a SPCC Plan and a Solid Waste Management Plan, which addresses management of hazardous materials.</td>
<td>Same as Baseline Condition.</td>
<td>Hazardous materials would be used and stored on site in accordance with applicable regulations including secondary containment for fuels and other hazardous materials. Perpetua would develop documents for use and storage including a SPCC Plan and a Solid and Hazardous Materials Handling and Emergency Response Plan, which addresses management of hazardous materials. Following regulatory requirements and plans for spill containment, control, and response would reduce the potential for spills and for impacts associated with those spills.</td>
<td>Same as Baseline Condition.</td>
<td>Same as Baseline Condition.</td>
</tr>
<tr>
<td>Hazardous materials transport traffic volumes during construction, operations, and closure and reclamation.</td>
<td>Petroleum products are transported to the site on an as-needed basis.</td>
<td>Same as Baseline Condition.</td>
<td>Overall heavy vehicle traffic between the SGLF to SGP, of which hazardous materials transport would be a part, would be approximately 45 trips per day as an AADT count for construction; for operations, the heavy vehicle AADT would be 33 daily trips; and for closure and reclamation the AADT would be 15 daily trips. These trips represent the risk of a traffic accident.</td>
<td>Overall heavy vehicle traffic between the SGLF to SGP, of which hazardous materials transport would be a part, would be approximately 45 trips per day as an AADT count for construction; for operations, the heavy vehicle AADT would be 33 daily trips; and for closure and reclamation the AADT would be 15 daily trips. These trips represent the risk of a traffic accident.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Travel route road hazards.</td>
<td>The existing routes are a combination of paved routes (Warm Lake Road) and existing native surface roads. There are potential road hazards along the routes used for delivery of supplies for the exploration project including landslide and rockslide areas, avalanche paths and routes close to streams. These would represent a potential for hazard for accidents and spills.</td>
<td>Same as Baseline Condition.</td>
<td>Burntlog Route has 26 landslide/ rockslide areas and 38 avalanche paths. Nine miles of the travel way have streams within 0.5 mile. The route crosses 37 streams.</td>
<td>Johnson Creek Route has potential road hazards, including 45 landslide or rockfall areas and 94 avalanche paths. Twenty-seven miles of the route have streams within 0.5 mile of the travel way. The route crosses 43 streams.</td>
<td>Same as Baseline Condition.</td>
</tr>
<tr>
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| The SGP may cause changes in quantity of surface water and groundwater in all drainages within the analysis area. | Stream flow characteristics (daily, seasonal, annual). | Surface waters include the East Fork SFSR, Rabbit Creek, Meadow Creek, EFMC (also known as Blowout Creek), Garnet Creek, Fiddle Creek, Midnight Creek, Hennessy Creek, West End Creek, and Sugar Creek. Monthly average seasonal low flows:  
• Meadow Creek between TSF and Hangar Flats pit = 2.7 cfs  
• Meadow Creek below the diversion and above East Fork SFSR (Mine Years 7-10) = 3.8 cfs | Same as Baseline Condition. | Low flow would be reduced at some locations during some periods of the SGP operations up to 14 percent in East Fork SFSR (at USGS Gaging Station 13311250) and up to 40 percent in Meadow Creek (downstream of the Hangar Flats diversion but upstream of the confluence with East Fork SFSR). Surface flows are generally predicted to recover to pre-mine conditions within approximately 3 years after operations cease. | Same as the 2021 MMP. |
| The extent, magnitude, and duration of groundwater level changes. | Groundwater flow in the analysis area occurs primarily in the Quaternary unconsolidated deposits filling the valleys and through the unconsolidated deposits covering the mountainsides. | Same as Baseline Condition. | Dewatering of open pits lowers groundwater levels in alluvial and bedrock formations during operations and post-closure periods. These lower levels reduce flows in streams that receive groundwater discharge. There are 93 seep and spring locations within the area of groundwater drawdown that could be affected by lower water levels to the extent that any of these specific seeps or springs are receiving discharge from the aquifer affected by groundwater pumping. In most areas, groundwater levels recover within 10 years. However, groundwater levels below and directly downstream from facilities lined as part of mine closure (the TSF, TSF Buttress, Yellow Pine Pit backfill, and Hangar Flats Pit backfill) would be permanently lower due to reduced local recharge. | Same as the 2021 MMP. |
| The SGP may affect water rights. | Change in water rights availability in the SGP area. | Four existing water rights at the SGP owned by Perpetua. | Same as Baseline Condition; No changes in water rights availability. | No changes in water rights availability in the SGP area. | May affect downstream water rights. | Same as the 2021 MMP. |
| New water rights needed. | Existing water rights held by Perpetua: | 77-7285 - Groundwater right for storage and mining with diversion of 0.5 cfs for a maximum total usage of 39.2 acre-feet  
77-7141 – Groundwater right for domestic with diversion of 0.2 cfs for a maximum total usage of 11.4 acre-feet  
77-7293 – Surface water right for storage and mining for diversion of 0.25 cfs and a maximum total usage of 20 acre-feet.  
77-7122 – Surface water right for storage and mining for diversion of 0.33 cfs for a maximum total usage of 7.1 acre-feet. | Same as Baseline Condition; No new water rights required. | Up to an additional 9.6 cfs of water rights needed to support ore processing. An additional total of 0.28 cfs of groundwater rights needed for potable water supply at the Stibnite Worker Housing Facility, Burntlog Maintenance Facility, and SGLF. | Same as the 2021 MMP. |
### Surface and Ground Water Quality

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</table>
| The SGP may affect soil and water resources through acid rock drainage and/or metals leaching from mineralized rock in the mine pits, development rock, and TSF. | Volume and disposition of mineralized waste generated. | No new mining waste generated. | No new mining waste generated. | Development Rock:  
- TSF buttress and embankment (142 MT)  
- Yellow Pine Pit backfill (113 MT)  
- Midnight Pit backfill (7 MT)  
- Hangar Flats Pit partial backfill (18 MT)  
- On-site lime generation (1 MT)  
**Tailings:**  
- TSF (115 MT) | Same as 2021 MMP. |
| | Lithologic composition of final pit walls and exposure of potentially acid generating material. | No known mapped extent of exposed lithologies in existing Yellow Pine and West End pits. | No known mapped extent of exposed lithologies in existing Yellow Pine and West End pits. | Area of PAG rock exposed in pit walls:  
- Hangar Flats Pit (7.9% of total surface area; 6% of surface area above backfill elevation).  
- West End Pit (0.4%)  
- Midnight Area (0.1%)  
- Yellow Pine Pit (20.1% of total surface area; 3% of surface area above backfill elevation) | Same as 2021 MMP. |
| | Removal of legacy mine tailings and waste rock. | Legacy waste in Meadow Creek valley from historical mine operations, including SODA and Bradley tailings. | No removal of legacy mine tailings and waste rock. | SODA and Bradley tailings removed and repurposed. | Same as 2021 MMP. |
| | Predicted leachate chemistry of development rock and tailings. | Not Applicable. | Same as Baseline Condition. | Development Rock and Tailings are generally non-acid generating but capable of leaching arsenic, antimony, aluminum, manganese, sulfate, TDS, copper, cadmium, and zinc above water quality criteria. | Same as 2021 MMP. |
| The SGP may cause changes in surface water and groundwater quality. | Surface water quality parameters (e.g., pH, temperature, major ions, total dissolved solids, metals, sediment content, and organic carbon). | | | | |

**East Fork SFSR:**  
- Antimony (0.005 to 0.037 mg/L)  
- Arsenic (0.014 to 0.076 mg/L)  
- Mercury (5 to 10 ng/L)  
- Summer Max Temperature (13.4 to 17.4 °C)  
**Meadow Creek:**  
- Antimony (0.001 to 0.025 mg/L)  
- Arsenic (0.004 to 0.075 mg/L)  
- Mercury (1 to 2 ng/L)  
- Summer Max Temperature (17.9 to 19.8 °C)  
**West End Creek:**  
- Antimony (0.008 to 0.012 mg/L)  
- Arsenic (0.064 to 0.088 mg/L)  
- Mercury (4 to 6 ng/L)  
- Summer Max Temperature (12.9 °C)  
**East Fork SFSR:**  
- Antimony (0.004 to 0.041 mg/L)  
- Arsenic (0.010 to 0.066 mg/L)  
- Mercury (4 to 10 mg/L)  
- Summer Max Temperature (13.4 to 18.0 °C)  
**Meadow Creek:**  
- Antimony (0.001 to 0.014 mg/L)  
- Arsenic (0.001 to 0.018 mg/L)  
- Mercury (1 to 5 ng/L)  
- Summer Max Temperature (14.6 to 24.5 °C)  
**West End Creek:**  
- Antimony (0.002 to 0.014 mg/L)  
- Arsenic (0.008 to 0.095 mg/L)  
- Mercury (4 to 63 ng/L)  
- Summer Max Temperature (16.8 to 21.7 °C)  

<table>
<thead>
<tr>
<th>Surface and Ground Water Quality</th>
<th></th>
<th></th>
<th>Same as Baseline Condition.</th>
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<td></td>
<td>Potential for spills in proximity to streams and sedimentation from access road traffic</td>
<td>No mine-related traffic on existing Forest Service roads</td>
<td>Same as Baseline Condition.</td>
<td>Mine access roads would cross 71 different streams. 1.56 miles (4% of routes) would be within 100 feet of streams. Sedimentation and fugitive dust predicted to be within normal range of properly maintained Forest Service roads.</td>
<td>Mine access roads would cross 50 different streams. 6.5 miles (18% of routes) would be within 100 feet of streams. Sedimentation and fugitive dust predicted to be within normal range of properly maintained Forest Service roads.</td>
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<td></td>
<td>Sedimentation from utility stream crossings</td>
<td>No transmission line upgrades or new lines constructed</td>
<td>Same as Baseline Condition.</td>
<td>Mine utility work would cross 36 different streams. Potential for transmission line-related erosion and sedimentation would be minimized by BMPs.</td>
<td>Same as 2021 MMP.</td>
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</table>
|       | Groundwater quality parameters (e.g., pH, major ions, total dissolved solids, metals) | TSF area groundwater:  
  - pH (7.57)  
  - Arsenic (0.0005 to 1.8 mg/L)  
  - Antimony (0.002 to 0.61 mg/L)  
  - Mercury (0.6 mg/L)  
  Hangar Flats:  
  - pH (6.4 to 7.2)  
  - Arsenic (0.0005 to 1.8 mg/L)  
  - Antimony (0.002 to 0.61 mg/L)  
  - Mercury (10 to 43 ng/L)  
  Yellow Pine:  
  - pH (6.8 to 8.2)  
  - Arsenic (0.13 to 0.32 mg/L)  
  - Antimony (0.010 to 0.014 mg/L)  
  - Mercury (0.8 to 3 ng/L)  
  West End:  
  - pH (7.4 to 7.9)  
  - Arsenic (0.009 mg/L)  
  - Antimony (0.002 mg/L)  
  - Mercury (47 to 55 ng/L) | Same as Baseline Condition. | TSF area groundwater:  
  - pH (7.6)  
  - Arsenic (0.041 to 0.095 mg/L)  
  - Antimony (0.021 to 0.050 mg/L)  
  - Mercury (13 to 33 ng/L)  
  Hangar Flats:  
  - pH (8.3)  
  - Arsenic (0.009 to 0.48 mg/L)  
  - Antimony (0.003 to 0.22 mg/L)  
  - Mercury (1 to 50 ng/L)  
  Yellow Pine:  
  - pH (8.1)  
  - Arsenic (0.34 to 0.58 mg/L)  
  - Antimony (0.016 to 0.021 mg/L)  
  - Mercury (10 to 30 ng/L)  
  West End:  
  - pH (8.3)  
  - Arsenic (0.09 to 0.13 mg/L)  
  - Antimony (0.016 to 0.021 mg/L)  
  - Mercury (13 to 33 ng/L) | Same as Baseline Condition. | Water treatment for mercury concentrations to target levels would result in methylmercury concentrations up to 0.24 ng/L in discharge to surface waters (at a 2% methylation rate). However, predicted MeHg concentrations in streams would remain below 0.1 ng/L. | Same as 2021 MMP. |
<p>|       | Vegetation | The SGP may cause increased mercury methylation in adjacent waterbodies through SGP-related emissions and activities. | Predicted impact on methyl mercury (MeHg) production. MeHg not detected in 90 percent of baseline stream samples (&lt;0.1 ng/L) | Same as Baseline Condition. | The 2021 MMP would remove an estimated 2,083.2 acres of previously undisturbed forest PVGs within the boundaries of the Forests. | The Johnson Creek Route Alternative would remove an estimated 1,959.4 acres of previously undisturbed forest PVGs within the boundaries of the Forests. |
|       | Acres of disturbance to previously undisturbed forest PVGs within Forest Service boundaries. | PVG data are available for the analysis area on NFS lands in the PNF and BNF. | Same as Baseline Condition. | The 2021 MMP would remove an estimated 2,083.2 acres of previously undisturbed forest PVGs within the boundaries of the Forests. | The Johnson Creek Route Alternative would remove an estimated 1,959.4 acres of previously undisturbed forest PVGs within the boundaries of the Forests. |</p>
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<tr>
<td>The SGP would impact non-forested areas (i.e., those that are identified through PVG mapping as not being successional to forest) within Forest Service-administered land and could impact the ability of these areas to reach desired conditions.</td>
<td>Acres of disturbance to previously undisturbed non-forested areas within Forest Service boundaries.</td>
<td>PVG and existing vegetation data are available for the analysis area on NFS lands in the PNF and BNF.</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP would remove an estimated 161.5 acres of previously undisturbed non-forest areas within the boundaries of the Forests.</td>
<td>The Johnson Creek Route Alternative would remove an estimated 151.9 acres of previously undisturbed non-forest vegetation within the boundaries of the Forests.</td>
</tr>
<tr>
<td>The SGP would impact vegetation outside the boundaries of the Forests.</td>
<td>Acres of disturbance in previously undisturbed LANDFIRE existing vegetation types outside Forest Service boundaries.</td>
<td>LANDFIRE data are available for the analysis area outside NFS lands.</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP would remove an estimated 450.2 acres of previously undisturbed vegetation communities outside Forest Service-administered lands.</td>
<td>The Johnson Creek Route Alternative would remove an estimated 450.2 acres of previously undisturbed vegetation communities outside Forest Service-administered lands.</td>
</tr>
<tr>
<td>The SGP would remove whitebark pine individuals, and habitat conversion associated with the SGP would impact seed production, dispersal, and establishment of this species.</td>
<td>Number of acres of whitebark pine occupied habitat impacted by the SGP.</td>
<td>Results of whitebark pine surveys (Tetra Tech 2020b) are available within suitable habitat in the analysis area. Approximately 2,069 acres of occupied whitebark pine habitat were identified within the analysis area.</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP would remove an estimated 259.4 acres of occupied whitebark pine habitat (12.5% of occupied habitat in the analysis area).</td>
<td>The Johnson Creek Route Alternative would remove an estimated 108.4 acres of occupied whitebark pine habitat (5.2% of occupied habitat in the analysis area).</td>
</tr>
<tr>
<td>The SGP would impact known occurrences of sensitive and forest watch plant species.</td>
<td>Presence of known occurrences of special status plants or occupied habitat within 300 feet of the SGP disturbance area.</td>
<td>Rare Plant Geographic Information System Data are available for the SGP area (IFWIS 2017).</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP would impact known occurrences of bent-flowered milkvetch, least moonwort, Sacajawea’s bitterroot, Blandow’s helodium, sweetgrass, and Rannoch-rush.</td>
<td>The Johnson Creek Route Alternative would impact known occurrences of bent-flowered milkvetch, least moonwort, Sacajawea’s bitterroot.</td>
</tr>
<tr>
<td>The SGP would result in a direct loss of modeled potential habitat for sensitive and forest watch plant species.</td>
<td>Acres of modeled potential habitat lost.</td>
<td>Modeled potential habitat for special status plant species is available for the SGP area.</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP would impact 3,991.0 acres of modeled potential habitat for sensitive and forest watch plant species.</td>
<td>The Johnson Creek Route Alternative would impact 3,203.6 acres of modeled potential habitat for sensitive and forest watch plant species.</td>
</tr>
<tr>
<td>SGP actions would result in increased potential for non-native plant establishment and spread.</td>
<td>Total acres of land disturbed by the SGP.</td>
<td>PVG data are available for the analysis area on NFS lands in the PNF and BNF and LANDFIRE data are available for the analysis area outside Forest Service lands.</td>
<td>Same as Baseline Condition.</td>
<td>The 2021 MMP-related vegetation clearing would impact 3,563.7 acres, including primarily undisturbed areas for the Burntlog Route where an increase in the potential for non-native plant establishment and spread would be more deleterious.</td>
<td>The Johnson Creek Route Alternative would impact 3,399.3 acres through vegetation clearing; however, much of the disturbance area would be along or near previously disturbed areas (i.e., existing roads) where non-native plants are already established or could become established as a result of previously authorized activities.</td>
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<tr>
<td>Wetland and Riparian</td>
<td>Within the mine site focus area - Acres of wetland and riparian habitat lost due to SGP construction.</td>
<td>There are 429 acres of wetlands delineated in the mine site focus area. There are 2,665 acres of RCAs mapped in the mine site focus area.</td>
<td>Same as Baseline Condition.</td>
<td>119.8 acres of wetlands would be lost at the mine site (28% of wetlands at the mine site). 618.9 acres of riparian areas would be lost at the mine site.</td>
<td>Same as 2021 MMP.</td>
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<tr>
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<td>Within the off-site focus area - Acres of wetland and riparian habitat lost through SGP construction.</td>
<td>There are 2,138.6 acres of wetland delineated in the off-site focus area. There are 127,389 acres of RCAs mapped in the off-site focus area.</td>
<td>Same as Baseline Condition.</td>
<td>76.3 acres of wetlands would be lost within the off-site focus area. 299.5 acres of riparian areas would be lost within the off-site focus area.</td>
<td>71.2 acres of wetlands would be lost within the off-site focus area. 352.6 acres of riparian areas would be lost within the off-site focus area.</td>
</tr>
<tr>
<td>Impacts on wetland and riparian functions¹</td>
<td>Functional units of wetlands, including high-value wetlands (i.e., Category I and II per Montana Wetland Assessment Method [MWAM]), lost due to SGP construction.</td>
<td>Existing Wetland Functions and Values of AAs assessed for the SGP are available for the analysis area.</td>
<td>Same as Baseline Condition.</td>
<td>1,054.4 functional units would be lost, including 375.9 high-value functional units.</td>
<td>1,028.3 functional units would be lost, including 370.6 high-value functional units.</td>
</tr>
<tr>
<td></td>
<td>Wetland and riparian area fragmentation.</td>
<td></td>
<td>Same as Baseline Condition.</td>
<td>39 wetlands would be crossed by new roads.</td>
<td>Six wetlands would be crossed by new roads.</td>
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<td></td>
<td>Total area (in acres) of wetlands that would be lost.</td>
<td>See first row in this table for acreages on wetlands and RCAs</td>
<td>Same as Baseline Condition.</td>
<td>196.1 wetland acres lost.</td>
<td>191.0 wetland acres lost.</td>
</tr>
<tr>
<td>Alteration of wetland and riparian areas due to changes in water balance.</td>
<td>Wetlands within the groundwater analysis area are discussed in the Water Quantity Specialist Report (Forest Service 2022f).</td>
<td>Same as Baseline Condition.</td>
<td>4.6 acres of wetlands would be affected by drawdown. The entirety of these wetlands also would be subject to direct impacts from component construction.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Alteration of wetland and riparian areas due to changes in water quality.</td>
<td>Surface water and groundwater quality are discussed in the Water Quality Specialist Report (Forest Service 2022f).</td>
<td>Same as Baseline Condition.</td>
<td>The SGP would have the potential to impact wetland and riparian area water quality, primarily associated with sedimentation and traffic-related incidents. These impacts are discussed further in the Water Quality Specialist Report (Forest Service 2022f). These effects would be minimized through best management practices, spill prevention, and spill response measures. Effects if sedimentation and fugitive dust would be within normal range of properly maintained Forest Service roads.</td>
<td>Water quality effects on wetlands and riparian areas would be the same as the 2021 MMP, though no construction or use of Burntlog Route would eliminate water quality impacts in that area but would increase the impacts along the Johnson Creek Route that is parallel and near East Fork SFSR and Johnson Creek.</td>
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¹ Disturbance includes both temporary and permanent effects associated with transmission line construction.

Fish Resources and Fish Habitat

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<td>The SGP may cause changes in fish habitat in the analysis area that may affect aquatic species, including federally listed fish species and aquatic habitat (i.e., Critical Habitat) within and downstream of the SGP area.</td>
<td>Direct Impacts to Individuals</td>
<td>No mining related activities.</td>
<td>Same as Baseline Condition.</td>
<td>Individuals would be affected by dewatering, salvage, and relocation due to modification of stream channels and the dewatering of the Yellow Pine Pit lake.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Alter Physical Stream Structure</td>
<td>No mining related activities.</td>
<td>Same as Baseline Condition.</td>
<td>Diversion of stream channels, elimination of the Yellow Pine Pit lake, and new barriers would affect fish occupancy and habitat during construction and operations.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Changes to Water Temperature WCI</td>
<td>No mining related activities.</td>
<td>Same as Baseline Condition.</td>
<td>During operations summer maximum stream water temperatures in Meadow Creek and the East Fork South Fork would decrease by up to 3.7°C due to diversion of Meadow Creek around the TNF and TSF Buttress. Upon closure and routing of Meadow Creek to the restored stream channel on top of the reclaimed TSF, summer maximum stream temperatures would increase by up to 6.8°C due to the time needed for revegetation to result in riparian shading of the stream. Over time, summer maximum stream temperatures would decline to near or below baseline conditions except for the Meadow Creek upstream of East Fork Meadow Creek which would remain 1.1°C above existing conditions.</td>
<td>Same as 2021 MMP.</td>
<td>Same as 2021 MMP.</td>
</tr>
<tr>
<td>Sediment and turbidity from construction of temporary roads and transmission lines</td>
<td>No mine-related traffic on existing Forest Service Roads.</td>
<td>Same as Baseline Condition.</td>
<td>Access road roads would cross 43 streams and transmission lines would cross 37 streams. Construction: 6.5 miles (18% of routes) would be within 100 feet of streams. Operations: 1.56 miles (4% of routes) would be within 100 feet of streams. Sedimentation and fugitive dust predicted to be within normal range of properly maintained Forest Service roads.</td>
<td>Same as 2021 MMP except 6.5 miles of streams would be within 100 feet of streams during operations.</td>
<td>Same as Baseline Condition.</td>
</tr>
<tr>
<td>Change in Access to fish habitat through culverts from road construction</td>
<td>Use of existing roads and culverts.</td>
<td>Same as Baseline Condition.</td>
<td>Culvert replacements on the Burntlog Route may increase or re-establish habitat access for native and non-native species.</td>
<td>Same as Baseline Condition.</td>
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<tr>
<td>Change in amount of stream habitat by barrier removal and new barriers</td>
<td>Existing barriers in place.</td>
<td>Same as Baseline Condition.</td>
<td>Removal of the box culvert in the EFFSFR would provide additional access to around 6 km of intrinsic potential habitat for Chinook salmon and steelhead, with the removal of the barrier at the YPP lake cascade adding more than an additional 2.5 km for Chinook salmon. Removal of these barriers will improve access to nearly 33 km of habitat for bull trout and westslope cutthroat trout, thus improving genetic integration. Removal of barriers in the downstream end of Fiddle Creek would provide an additional 2 km of habitat for bull trout and westslope cutthroat trout. Creation of a partial gradient barrier in East Fork Meadow Creek would provide additional access to habitat for bull trout and westslope cutthroat trout. The removal and addition of barriers in Meadow Creek would ultimately result in a reduction in access to the Meadow Creek headwaters.</td>
<td>Same as 2021 MMP.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Changes to Chemical Contaminants Associated with Spills</td>
<td>No mining related activities.</td>
<td>Same as Baseline Condition.</td>
<td>Effects of spills would be managed via application of Forest Service requirements and project design features to minimize effects.</td>
<td>Same as 2021 MMP. Effects from spills would be potentially more significant because 6.5 miles of the permanent access road would be within 100 feet of streams during operations.</td>
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<tr>
<td>Changes to Chemical Contaminants Associated with Mining Activity</td>
<td>TSF Area</td>
<td>Aluminum: No exceedance</td>
<td>Copper: No exceedance</td>
<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td>Arsenic: 0.004 mg/L to 0.075 mg/L</td>
<td>Aluminum: No exceedance</td>
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<td>Mercury: 1 ng/L to 2 ng/L</td>
<td>EFSFSR Downstream from SGP</td>
<td>Copper: No exceedance</td>
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<td></td>
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<td>EFSFSR Downstream from SGP</td>
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<td>Copper: No exceedance</td>
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<td>Same as 2021 MMP.</td>
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<td>Copper: No exceedance</td>
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<td>Mercury: 1 ng/L to 2 ng/L</td>
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<td></td>
<td>Increased seasonal peaks in mercury concentrations would be 1 to 3 ng/L</td>
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<td>above existing conditions in the mine area but below applicable water</td>
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<td>methylated mercury concentrations in the mine site area are comparable to</td>
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<td>existing conditions based on site-specific ratios of methylmercury to</td>
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<td>mercury concentrations on downstream mercury methylation have not been</td>
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<td></td>
<td>quantified.</td>
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<tr>
<td>Changes in Stream Flow</td>
<td>No mining related activities.</td>
<td>Same as Baseline Condition.</td>
<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td></td>
<td>EFSFSR Upstream from Sugar Creek</td>
<td>Up to 24.8% reduction in flow during operations.</td>
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<td>No reduction in flow post-closure.</td>
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<td>EFSFSR at Stibnite</td>
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<td>Up to 20.4% reduction in flow during operations.</td>
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<td>No reduction in flow post-closure.</td>
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<td>EFSFSR Upstream from Meadow Creek</td>
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<td>Up to 3.8% reduction in flow during operations.</td>
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<td>No reduction in flow post-closure.</td>
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<td>EFSFSR Upstream from Meadow Creek</td>
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<td>Up to 2% reduction in flow during operations.</td>
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<td>No reduction in flow post-closure.</td>
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<td></td>
<td>Meadow Creek</td>
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<td>Up to 36.4% reduction in flow during operations.</td>
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<td>Less than 1% reduction in flow post-closure.</td>
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Stibnite Gold Project Supplemental Draft Environmental Impact Statement 2-147
<table>
<thead>
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<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
</table>
|       | Suitable Habitat Based on Optimal Thermal Requirements for Chinook Salmon | Below Yellow Pine Pit:  
  Adult Migration (15-19°C): 0 km  
  Adult Migration (12-17°C): 2.01 km  
  Spawning (13°C): 0 km  
  Spawning (4-14°C): 2.01 km  
  Incubation: 0 km  
  Juvenile Rearing: 2.01 km  
  Total Available: 2.01 km  

Above Yellow Pine Pit:  
  Adult Migration: 2.43 km  
  Adult Migration (12-17°C): 7.48 km  
  Spawning (13°C): 1.51 km  
  Spawning (4-14°C): 10.92 km  
  Incubation: 3.44 km  
  Juvenile Rearing: 10.92 km  
  Total Available: 10.92 km | Same as Baseline Condition.  
|       |            | Middle of Operations:  
  Below Yellow Pine Pit:  
  Adult Migration: 0 km  
  Adult Migration (12-17°C): 1.48 km  
  Spawning (13°C): 0 km  
  Spawning (4-14°C): 1.48 km  
  Incubation: 0 km  
  Juvenile Rearing: 1.48 km  
  Total Available: 1.48 km  

Above Yellow Pine Pit:  
  Adult Migration: 0.25 km  
  Adult Migration (12-17°C): 3.35 km  
  Spawning (13°C): 0.28 km  
  Spawning (4-14°C): 6.85 km  
  Incubation: 3.50 km  
  Juvenile Rearing: 10.94 km  
  Total Available: 10.94 km  

Post-Closure:  
  Below Yellow Pine Pit:  
  Adult Migration: 0 km  
  Adult Migration (12-17°C): 1.66 km  
  Spawning (13°C): 0 km  
  Spawning (4-14°C): 1.66 km  
  Incubation: 0.73 km  
  Juvenile Rearing: 1.66 km  
  Total Available: 1.66 km  

Above Yellow Pine Pit:  
  Adult Migration: 0 km  
  Adult Migration (12-17°C): 6.57 km  
  Spawning (13°C): 0 km  
  Spawning (4-14°C): 10.07 km  
  Incubation: 7.39 km  
  Juvenile Rearing: 18.97 km  
  Total Available: 18.97 km | Same as 2021 MMP.  

|       | Chinook Salmon Flow Productivity | EFSFSR Upstream of Sugar Creek: 1.06  
  EFSFSR at Stibnite: 1.06  
  EFSFSR Upstream of Meadow Creek: 1.06  
  Meadow Creek: 1.06 | Same as Baseline Condition.  
|       |            | EFSFSR Upstream from Sugar Creek:  
  Up to 21.4% reduction during operations.  
  No reduction post-closure.  
  EFSFSR at Stibnite:  
  Up to 17.7% reduction during operations.  
  No reduction post-closure.  
  EFSFSR Upstream from Meadow Creek:  
  Up to 3.3% reduction during operations.  
  Up to 1.8% reduction post-closure.  
  Meadow Creek:  

|       |            | Same as 2021 MMP.  

Stibnite Gold Project Supplemental Draft Environmental Impact Statement 2-148
<table>
<thead>
<tr>
<th>Issue</th>
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<tr>
<td>Chinook Salmon Intrinsic Potential</td>
<td></td>
<td>11.15 km</td>
<td>Same as Baseline Condition.</td>
<td>Operations: Loss of 3.34 km (30 percent) Closure: Gain of 0.28 km (2 percent).</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Chinook Salmon Critical Habitat</td>
<td>EFSFSR above Yellow Pine Pit: 25.88 km Meadow Creek: 6.81 km</td>
<td>Same as Baseline Condition.</td>
<td>Operations: Above Yellow Pine Pit: 25.9 km Closure: Above Yellow Pine Pit: 25.9 km</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Suitable Habitat Based on Optimal Thermal Requirements for Steelhead</td>
<td>Below Yellow Pine Pit: Incubation: 2.01 km Juvenile Rearing: 2.01 km Total Available: 2.01 km</td>
<td>Same as Baseline Condition.</td>
<td>Middle of Operations: Below Yellow Pine Pit: Incubation: 0 km Juvenile Rearing: 1.66 km Total Available: 1.66 km Above Yellow Pine Pit: Incubation: 0 km Juvenile Rearing: 8.52 km Total Available: 8.52 km Post-Closure: Below Yellow Pine Pit: Incubation: 0 km Juvenile Rearing: 1.66 km Total Available: 1.66 km Above Yellow Pine Pit: Incubation: 0 km Juvenile Rearing: 10.07 km Total Available: 10.07 km</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Steelhead Flow Productivity</td>
<td>EFSFSR Upstream from Sugar Creek: 1.24 EFSFSR at Stibnite: 1.24 EFSFSR Upstream from Meadow Creek: 1.24 Meadow Creek: 1.24</td>
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<td>EFSFSR Upstream from Sugar Creek: Up to 21.1% reduction during operations. No reduction post-closure. EFSFSR at Stibnite: Up to 17.6% reduction during operations. No reduction post-closure. EFSFSR Upstream from Meadow Creek: Up to 1.8% reduction during operations. No reduction post-closure. Meadow Creek: Up to 29.5% reduction during operations. Less than 1% reduction post-closure.</td>
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<td>Steelhead Intrinsic Potential</td>
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<td>10.67 km</td>
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<td>Operations: Loss of 2.33 km (22 percent)</td>
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<td></td>
<td>Steelhead Critical Habitat</td>
<td>No critical habitat at mine site. Critical habitat in proximity to access routes could be affected by spills.</td>
<td>Same as Baseline Condition.</td>
<td>No change from Baseline for mine site area.</td>
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<td>Suitable Habitat Based on Optimal Thermal Requirements for Bull Trout</td>
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<tr>
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<td>Spawning - FA:</td>
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<td>Juvenile Rearing - FR: 8.29 km</td>
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<td>Total Available: 16.05 km</td>
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<td>EFSFSR between YPP and Sugar Creek: 15.3%</td>
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<td>EFSFSR at between Meadow Creek and YPP: 10.0%</td>
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<td>EFSFSR Upstream of Meadow Creek: 8.4%</td>
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<td>Meadow Creek: 5.7%</td>
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<td>Same as 2021 MMP.</td>
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<td>EFSFSR between YPP and Sugar Creek: 12.4% - 22.6% during operations. 16.1% post-closure</td>
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<td>EFSFSR at between Meadow Creek and YPP: 12.4% - 15.2% during operations. 14% post-closure.</td>
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<td>EFSFSR Upstream of Meadow Creek: 8.5% - 9.6% during operations. 9.7% post-closure.</td>
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<td>Meadow Creek: 6.7% - 7.8% during operations. 8.7% post-closure.</td>
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<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR between YPP and Sugar Creek: 0.5 – 0.7 km during operations. 0.7 km post-closure</td>
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<td>EFSFSR at between Meadow Creek and YPP: 5.6 – 7.8 km during operations. 8.1 km post-closure.</td>
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<td>EFSFSR Upstream of Meadow Creek: 13.1 – 13.9 km during operations. 13.1 km post-closure. Meadow Creek: 6.8 - 7.4 km during operations. 14.0 km post-closure.</td>
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<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR between YPP and Sugar Creek: 0.5 – 0.7 km during operations. 0.7 km post-closure</td>
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<td>EFSFSR at between Meadow Creek and YPP: 5.6 – 7.8 km during operations. 8.1 km post-closure.</td>
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<td>EFSFSR Upstream of Meadow Creek: 13.1 – 13.9 km during operations. 13.1 km post-closure. Meadow Creek: 6.8 - 7.4 km during operations. 14.0 km post-closure.</td>
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<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR between YPP and Sugar Creek: 0.5 – 0.7 km during operations. 0.7 km post-closure</td>
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<td>EFSFSR at between Meadow Creek and YPP: 5.6 – 7.8 km during operations. 8.1 km post-closure.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR Upstream of Meadow Creek: 13.1 – 13.9 km during operations. 13.1 km post-closure. Meadow Creek: 6.8 - 7.4 km during operations. 14.0 km post-closure.</td>
<td>Same as 2021 MMP.</td>
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<td>Same as Baseline Condition.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR between YPP and Sugar Creek: 0.5 – 0.7 km during operations. 0.7 km post-closure</td>
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<td>EFSFSR at between Meadow Creek and YPP: 5.6 – 7.8 km during operations. 8.1 km post-closure.</td>
<td>Same as 2021 MMP.</td>
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<td>EFSFSR Upstream of Meadow Creek: 13.1 – 13.9 km during operations. 13.1 km post-closure. Meadow Creek: 6.8 - 7.4 km during operations. 14.0 km post-closure.</td>
<td>Same as 2021 MMP.</td>
</tr>
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<tr>
<td>Westslope Cutthroat Trout Distance Weighted Average Occupancy Probabilities</td>
<td>EFSFSR Upstream of between YPP and Sugar Creek: 68.0%</td>
<td>Same as Baseline Condition.</td>
<td>EFSFSR Upstream of between YPP and Sugar Creek: 65.5% - 70.2% during operations.</td>
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<tr>
<td></td>
<td>EFSFSR at between Meadow Creek and YPP: 64.2%</td>
<td></td>
<td>67.7% post-closure</td>
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<tr>
<td></td>
<td>EFSFSR Upstream of Meadow Creek: 64.3%</td>
<td></td>
<td>EFSFSR at Stibnite: 65.0% - 66.5% during operations.</td>
<td></td>
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<tr>
<td></td>
<td>Meadow Creek: 63.9%</td>
<td></td>
<td>65.4% post-closure</td>
<td></td>
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</tr>
<tr>
<td>Westslope Cutthroat Trout Length of Available Habitat for Potential Occupancy</td>
<td>EFSFSR between YPP and Sugar Creek: 1.2 km</td>
<td>Same as Baseline Condition.</td>
<td>EFSFSR between YPP and Sugar Creek: 0.5 - 0.7 km during operations.</td>
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<td></td>
<td>EFSFSR at between Meadow Creek and YPP: 6.7 km</td>
<td></td>
<td>0.8 km post-closure</td>
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<td></td>
<td>EFSFSR Upstream of Meadow Creek: 13.1 km</td>
<td></td>
<td>EFSFSR at between Meadow Creek and YPP: 5.6 - 7.8 km during operations.</td>
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<td></td>
<td>Meadow Creek: 13.1 km</td>
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<td>8.1 km post-closure</td>
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<td></td>
<td>EFSFSR Upstream of Meadow Creek: 13.1 - 13.9 km during operations.</td>
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<td></td>
<td></td>
<td></td>
<td>13.1 km post-closure</td>
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<td>Meadow Creek: 6.8 - 7.4 km during operations.</td>
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<td>14.0 km post-closure</td>
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<tr>
<td>Wildlife</td>
<td>Acres of general wildlife habitat disturbed.</td>
<td>Hydrologic Unit Code (HUC) 12</td>
<td>Direct Habitat Impacts: 3,266 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wildlife Analysis Area: 400,417 acres</td>
<td>Same as Baseline Condition.</td>
<td>Direct Habitat Impacts: 3,096 acres</td>
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<tr>
<td></td>
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<td>Canada Lynx Direct Impacts: 194 acres</td>
<td>Canada Lynx Direct Impacts: 175 acres</td>
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<td></td>
<td></td>
<td>NIDGS Direct Impacts: 63 acres</td>
<td>NIDGS Direct Impacts: 63 acres</td>
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<td></td>
<td></td>
<td>Wolverine Direct Impacts: 2,342 acres</td>
<td>Wolverine Direct Impacts: 2,005 acres</td>
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<td></td>
<td></td>
<td>White-headed Woodpecker: 16 acres</td>
<td>White-headed Woodpecker: 29 acres</td>
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<td></td>
<td></td>
<td>Lewis’s Woodpecker: 11 acres</td>
<td>Lewis’s Woodpecker: 25 acres</td>
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<td></td>
<td></td>
<td>American Three-toed Woodpecker: 57 acres</td>
<td>American Three-toed Woodpecker: 48 acres</td>
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<td></td>
<td></td>
<td>Black-backed Woodpecker: 89 acres</td>
<td>Black-backed Woodpecker: 80 acres</td>
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<tr>
<td></td>
<td></td>
<td>dusky Grouse: 160 acres</td>
<td>Dusky Grouse: 208 acres</td>
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<td></td>
<td></td>
<td>Boreal Owl: 37 acres</td>
<td>Boreal Owl: 36 acres</td>
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<tr>
<td></td>
<td></td>
<td>Fisher: 54 acres</td>
<td>Fisher: 45 acres</td>
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<td></td>
<td></td>
<td>Flammulated Owl: 44 acres</td>
<td>Flammulated Owl: 64 acres</td>
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<tr>
<td></td>
<td></td>
<td>Great Gray Owl: 270 acres</td>
<td>Great Gray Owl: 225 acres</td>
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<tr>
<td></td>
<td>Wildlife Analysis Area: 400,417 acres</td>
<td>Same as Baseline Condition.</td>
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<td></td>
<td>Canada Lynx Analysis Area: 656,493 acres</td>
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<td></td>
<td>Northern Idaho ground squirrel (NIDGS) Analysis Area: 17,917 acres</td>
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<td></td>
<td>Wolverine Analysis Area: 316,035 acres</td>
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<tr>
<td></td>
<td>Wildlife Analysis Area: 400,417 acres</td>
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</tbody>
</table>

*The SGP may cause changes in wildlife habitat in the analysis area that may affect wildlife species including special-status species (endangered, threatened, MIS, and sensitive species)*
### Issue

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Conditions</th>
<th>No Action Alternative</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres of disturbance and the proximity of the proposed mine operations to high-value habitats such as crucial and or high-value big game ranges, wetlands, and seep and spring areas.</td>
<td>N/A</td>
<td>Same as Baseline Condition.</td>
<td>Direct Habitat Impacts: 3,266 acres</td>
<td>Same as the 2021 MMP, with the exception of the Burntlog Route.</td>
</tr>
<tr>
<td>Change in noise levels (in decibels) in—or in proximity to—wildlife habitat</td>
<td>Existing ambient sound levels were measured at various noise-sensitive receptor sites and varied between 34 and 64 dBA.</td>
<td>Same as Baseline Condition.</td>
<td>Ongoing noise levels would attenuate to 55 dBA within 0.8 miles of the disturbances based on distance alone. Temporary disturbances (e.g., blasting, winter road maintenance) would be audible further away. Construction: Mine site noise would attenuate to 55 dBA at 0.8 mile from source; access road construction would attenuate to 55 dBA at 0.57 mile on distance alone. Operations: Based on distance alone, mine site noise would attenuate to 55 dBA at 1.5 miles; blasting would attenuate to 55 dBA at 2.2 miles; road maintenance would attenuate at 0.4 to 0.55 miles; and mine traffic would be below the threshold at 49 dBA. Closure: Noise impacts would be similar to the construction phase.</td>
<td>Same as the 2021 MMP, with the exception of the Burntlog Route — noise from traffic on Johnson Creek Route would be similar. Helicopter installation of utility structures would reduce habitat impacts but would introduce noise that could affect sensitive species. Construction: Helicopter use would attenuate to 55 dBA approximately 1.7 miles from the source of the activity on distance alone.</td>
</tr>
<tr>
<td>The SGP may affect wildlife by introducing barriers to movement, including the mine site, infrastructure, new/existing maintained roads, new transmission line.</td>
<td>Miles of new roads proposed for the SGP.</td>
<td>Access Roads – existing roads – 89 miles Utilities – existing roads – 30 miles</td>
<td>Access Roads – 15 miles new road on Burntlog Route Cabin Creek OSV route – 10.4 miles groomed OSV route Utilities – new utility access roads – 25 miles</td>
<td>Access Roads – No new access road miles. No Cabin Creek OSV route.</td>
</tr>
<tr>
<td>Acres of disturbance for new and upgraded transmission lines.</td>
<td>Existing transmission lines – 459 acres</td>
<td>Same as Baseline Condition.</td>
<td>New transmission lines – 115 acres Upgraded transmission lines – 158 acres</td>
<td>Same as the 2021 MMP.</td>
</tr>
<tr>
<td>Length of potential movement barriers.</td>
<td>There are no known or designated wildlife corridors for big game species or listed species. Linkage areas for Canada lynx have been estimated to occur north to south across Warm Lake Road, and east to west across the SFSR.</td>
<td>Same as Baseline Condition.</td>
<td>Potential barriers: • Mine Site – 6 miles long x 1 mile wide • Access Roads – new roads – 38 miles • Utilities – new utility access roads: 25 miles and new transmission corridors: 115 acres • Off-site Facilities – no barrier effects</td>
<td>Same as the 2021 MMP, with the exception of the Burntlog Route, which would reduce new access road mileage as a barrier.</td>
</tr>
<tr>
<td>The SGP may affect wildlife by potentially increasing the risk of direct injury or mortality.</td>
<td>Amount of increased traffic along the access routes, or acres of ground disturbance for less-mobile species.</td>
<td>Baseline AADT: • Warm Lake Road – 1,670 • Johnson Creek Road – 70 • Stibnite Road – 30 • Burnt Log Road – 70</td>
<td>AADT – Construction through Post Closure: • Warm Lake Road – 1,826 - 1,868 • Johnson Creek Road – 70 - 135 • Stibnite Road – 30 - 95 • Burnt Log Road – 120</td>
<td>AADT – Construction through Post Closure: • Warm Lake Road – 1,826 – 1,868 • Johnson Creek Road – 70 - 120 • Stibnite Road – 30 - 80</td>
</tr>
</tbody>
</table>

Stibnite Gold Project Supplemental Draft Environmental Impact Statement

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Miles of existing roads that are not currently plowed that would be plowed.</td>
<td>Currently plowed: Warm Lake Road – 26 miles Stibnite Road – 14 miles</td>
<td>Same as Baseline Condition.</td>
<td>Proposed (new) to be plowed: Burnt Log Road – 21 miles (currently groomed). Burnt Log Road Extension – 15 miles (proposed new).</td>
<td>Proposed (new) to be plowed: Johnson Creek Road – 17 miles (conversion of existing OSV portion of Johnson Creek Road).</td>
</tr>
<tr>
<td>Timber Resources</td>
<td>Volumes of timber resources removed.</td>
<td>Timber resources data are available for the analysis area on NFS lands in the PNF and BNF.</td>
<td>0 CF (total) 438,243 CF (total) 342,442 CF (Forest Service) 95,801 CF (Other Federal, State and Private Land)</td>
<td>547,994 CF (total) 447,058 CF (Forest Service) 100,926 CF (Other Federal, State and Private Land)</td>
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</tr>
<tr>
<td></td>
<td>Acres from which timber resources removed.</td>
<td>Timber resources data are available for the analysis area on NFS lands in the PNF and BNF.</td>
<td>0 acres (total) 595 acres (total) 468 acres (Forest Service) 127 acres (Other Federal, State and Private Timber)</td>
<td>733 acres (total) 691 acres (Forest Service) 132 acres (Other Federal, State and Private Timber)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acres suited for timber production permanently converted to other, non-productive land uses.</td>
<td>Maps of the Timberland Vegetation Communities in the analysis area are included in Section 3.14.</td>
<td>0 acres (total) 66 acres (BNF) 0 acres (PNF)</td>
<td>262 acres (BNF) 0 acres (PNF)</td>
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</tbody>
</table>

### Land Use and Land Management

<table>
<thead>
<tr>
<th>Issue</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Acres of total and new land disturbance within SGP area.</td>
<td>Existing disturbance acreage within analysis area: 1,554 acres (includes historic mine disturbance, existing roads and utilities)</td>
<td>Same as Baseline Condition.</td>
<td>Disturbance acreage impacts: 3,266 total acres 51% (1,674 acres) of total is new disturbance</td>
<td>Disturbance acreage impacts: 3,095 total acres 50% (1,544 acres) of total is new disturbance</td>
</tr>
<tr>
<td></td>
<td>The SGP could cause changes in or create new ROWs or easements.</td>
<td>Total existing ROW (transmission lines and roads): 666 acres</td>
<td>Same as Baseline Condition.</td>
<td>Total new ROW (transmission lines and roads): 763 acres</td>
<td>Total new ROW (transmission lines and roads): 639 acres</td>
</tr>
<tr>
<td>Access and Transportation</td>
<td>Number, location, and description of changes in access due to new and improved roadways.</td>
<td>See Table 3.16-1 and Figure 3.16-1.</td>
<td>Same as Baseline Condition.</td>
<td>Burnt Log Road (plowed). Mine site public access during operations (not plowed). Loss of winter groomed OSV trail on Warm Lake Road to Landmark. Loss of winter groomed OSV trail on Johnson Creek Road from Wapiti Meadows to Trout Creek campground during construction of Burntlog Route.</td>
<td>No Burntlog Route, only Johnson Creek Route (plowed). Mine site public access during operations (not plowed). Loss of winter groomed OSV trail on Warm Lake Road to Landmark. Loss of winter groomed OSV trail on Johnson Creek Road from Wapiti Meadows to Trout Creek campground for life of SGP.</td>
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Stibnite Gold Project Supplemental Draft Environmental Impact Statement
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>The SGP may change the miles of roads and trails, the amount of use, and types of vehicles on each road or trail.</td>
<td>Miles of new road for public use.</td>
<td>Forest Service = 1,557 miles Valley County = 278 miles State = 131 miles</td>
<td>Same as Baseline Condition.</td>
<td>Forest Service = no change Valley County = 2.2 miles State = no change Private = 13.5 miles (with an additional 4 miles through the SGP)</td>
<td>Forest Service = no change Valley County = 2.2 miles State = no change Private = 4 miles through the SGP</td>
</tr>
<tr>
<td>Change in amount of use.</td>
<td>See Table 3.16-1 for existing roads.</td>
<td>Same as Baseline Condition.</td>
<td>Johnson Creek Route = 5 mine-related vehicles/hr. (C) Burntlog Route = 4 mine-related vehicles/hr. (O); 2 mine-related vehicles/hr. (C-R)</td>
<td>Johnson Creek Route = 5 mine-related vehicles/hr. (C); 4 mine-related vehicles/hr. (O); 2 mine-related vehicles/hr. (C-R)</td>
<td></td>
</tr>
<tr>
<td>The SGP may affect public safety on the roads used by mine vehicles during construction, operations, and closure and reclamation activities.</td>
<td>Approximate miles of roads used by mine vehicles.</td>
<td>Johnson Creek Route = 70 miles South Fork Salmon River Road = 83 miles Burntlog Route = 0 mile (does not exist)</td>
<td>Same as Baseline Condition.</td>
<td>Johnson Creek Route = 70 miles Burntlog Route = 71 miles</td>
<td>Johnson Creek Route = 70 miles Burntlog Route = 0 mile</td>
</tr>
<tr>
<td>Change in traffic volume. (AADT)</td>
<td>Refer to Table 3.16-2.</td>
<td>Same as Baseline Condition.</td>
<td>C = 65 (45 HV) O = 50 (33 HV) C.R = 25 (13 HV) Post Closure = 6 (0 HV)</td>
<td>C = 65 (45 HV) O = 50 (33 HV) C-R = 25 (13 HV) Post Closure = 6 (0 HV)</td>
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</tr>
<tr>
<td>Number of accidents, both current and projected.</td>
<td>Warm Lake Road = 8/year Johnson Creek Road = 2/year Stibnite Road = 1/year</td>
<td>Same as Baseline Condition.</td>
<td>Perpetua would implement safety measures to reduce accidents including radio communications, pilot cars, and hour restrictions.</td>
<td>Perpetua would implement safety measures to reduce accidents including radio communications, pilot cars, and hour restrictions. Johnson Creek Route has a steeper topography and terrain that would require wider roads, more cut/fill sections, and more switchbacks.</td>
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<tr>
<td>Change in emergency access.</td>
<td>N/A</td>
<td>N/A</td>
<td>Additional access routes via public access through the SGP upon closure (C-R).</td>
<td>Additional access routes via public access during the winter (C) and through the SGP upon closure (C-R).</td>
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<tr>
<td>Change in OSV access.</td>
<td>Groomed OSV trail along Warm Lake Road from Warm Lake Parking Area to Landmark Groomed OSV trail along Johnson Creek Road from Trout Creek campground north to Wapiti Meadows</td>
<td>Same as Baseline Condition.</td>
<td>Groomed OSV from Warm Lake to Landmark closed for use for life of SGP. An alternative OSV route would be established from Trout Creek Campground to Landmark. Warm Lake area OSV would be created north of Warm Lake Road to southern end of Cabin Creek Road OSV trail to Warm Lake Road. OSV from Trout Creek Campground to Wapiti Meadows closed through construction of Burntlog Route.</td>
<td>Same as under the 2021 MMP; except the OSV from Trout Creek Campground to Wapiti Meadows closed for use for life of SGP.</td>
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### Heritage Resources

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<tr>
<th>Issue</th>
<th>Indicator</th>
<th>Baseline Conditions</th>
<th>No Action Alternative</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SGP may affect historic properties through ground disturbance.</td>
<td>Acres and locations of ground disturbance.</td>
<td>N/A</td>
<td>N/A</td>
<td>3,266 acres</td>
<td>2,986 acres Same as 2021 MMP except: Reduces ground disturbance via helicopter installation of repeater sites instead of roads. Limits disturbance for new road construction as Burntlog Route would not be constructed. Extensive upgrades to Johnson Creek and Stibnite Roads would be required including cut and fill areas.</td>
</tr>
<tr>
<td>Number of cultural resources that could be affected by ground disturbance.</td>
<td>A total of 52 historic properties are within the Physical are of potential effect (APE) Additional 99 historic properties are within the visual, auditory, and vibratory (VAV) APE. Numbers and locations of potential TCPs and CLs have not been publicly disclosed</td>
<td>Existing historic properties located in the analysis area would remain in their current states and would be expected to experience natural deterioration over time.</td>
<td>2021 MMP would impact through ground or physical disturbance three historic properties: Old Thunder Mountain Road (FR 440) Stibnite Lithic site IPCo Line 328 52 historic properties in Physical APE and 99 in VAV APE. Physical impacts to an unknown number of TCPs or CLs may occur. Impacts would be short term to permanent, localized, and minor to moderate depending on avoidance and mitigation.</td>
<td>Johnson Creek Route would impact, through ground or physical disturbance two historic properties Stibnite Lithic site IPCo Line 328 41 historic properties in Physical APE and 90 in VAV APE. Physical impacts to an unknown number of TCPs or CLs may occur. Impacts would be short term to permanent, localized, and minor to moderate depending on avoidance and mitigation.</td>
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</tr>
<tr>
<td>The SGP may affect above ground resources, TCPs, and CLs by introducing visual elements.</td>
<td>Locations of tall or massive SGP components where screening landscape features are lacking.</td>
<td>The existing Yellow Pine Pit is considered to be massive.</td>
<td>Same as Baseline Condition. Three open pits during operations, a TSF and TSF Buttress, and several other mining facilities would be present at the SGP. SGP off-site facilities.</td>
<td>Same as 2021 MMP.</td>
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</tr>
<tr>
<td>Number and types of cultural resources including TCPs and CLs that would have viewed altered.</td>
<td>A total of 151 historic properties are located within the VAV APE for both alternatives. Meadow Creek Lookout, Landmark Ranger Station, and Thunderbolt Mountain Lookout are standing. The integrity of the Stibnite Lithic site is sensitive to visual intrusions. Numbers and locations of potential TCPs and CLs have not been publicly disclosed.</td>
<td>No new impacts to the viewedshed of cultural resources.</td>
<td>Visual impacts would occur to: Meadow Creek Lookout, Stibnite Lithic site, and Thunderbolt Mountain Lookout. Integrity of the Stibnite Lithic site could be compromised by visual intrusions. Unknown number of TCPs and CLs; additional adverse visual effects are not anticipated to above-ground resources.</td>
<td>Same as 2021 MMP, except visual impacts would also occur to the Landmark Ranger Station.</td>
<td></td>
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<tr>
<td>The SGP may affect aboveground resources, TCPs, and CLs through noise and vibration disturbance.</td>
<td>Noise levels and locations of activities that would produce high noise levels and ground vibrations.</td>
<td>Current noise levels are intermittently louder than ambient due to approved activities.</td>
<td>Same as Baseline Condition. Vibrations would be caused by blasting, drilling, and ore crushing. Haul trucks would cause high noise levels, but these would be much shorter term and more intermittent.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
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<tr>
<td>Number and location of standing or fragile partially standing structures, TCPs, and CLs that could be impacted by increase in noise and vibrations.</td>
<td>There are no standing historic properties that would be subject to noise and vibration within the mine site. Numbers and locations of potential TCPs and CLs have not been publicly disclosed.</td>
<td>Same as Baseline Condition.</td>
<td>No architectural historic properties located within the SGP. An unknown number of TCPs and CLs could be impacted.</td>
<td>Same as the 2021 MMP.</td>
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</tr>
<tr>
<td>The SGP may cause increased visibility of cultural resources through increased public access via new roadways and improvements to existing roads.</td>
<td>Number and location of public access roads improved or constructed.</td>
<td>There are existing roads that currently access the SGP.</td>
<td>Same as Baseline Condition.</td>
<td>Johnson Creek Route, Burntlog Route.</td>
<td>Same as the 2021 MMP except: The Burntlog Route would not be constructed.</td>
</tr>
<tr>
<td>Number of cultural resources including TCPs and CLs that may be affected.</td>
<td>There are two historic properties (Old Thunder Mountain Road and Meadow Creek Lookout) along proposed new roadways and improvements to existing roads. Numbers and locations of potential TCPs and CLs have not been publicly disclosed.</td>
<td>Same as Baseline Condition.</td>
<td>Increased public access beyond baseline conditions along the Burntlog Route once constructed and along Johnson Creek Route during construction, as well as to an unknown number of potential TCPs and CLs.</td>
<td>Same as the 2021 MMP except: There would be increased public access beyond baseline conditions along Johnson Creek Route.</td>
<td></td>
</tr>
<tr>
<td>The SGP may affect public safety on the roads used by mine vehicles during construction, operation, closure, and reclamation activities.</td>
<td>Number of SGP-related vehicles and trips on public roads.</td>
<td>SGP area is dominated by unpaved roads, one state highway, and county roads. The road segment of highest safety and traffic concern is Warm Lake Road.</td>
<td>Same as Baseline Condition.</td>
<td>Major The increased mine-related traffic on Warm Lake Road and other access roads increases the potential for accidents.</td>
<td>Major The use of Johnson Creek Route during operations, closure, and reclamation would increase safety issues by routing heavy truck traffic through the Village of Yellow Pine and the general public traveling on the same road as large mining equipment.</td>
</tr>
<tr>
<td>The SGP may affect human health or exposure to hazards.</td>
<td>Current public health statistics and descriptors.</td>
<td>Valley County ranks sixth best in state for health outcomes and fourth best in the state for overall health factors</td>
<td>Same as Baseline Condition.</td>
<td>The economic benefits could lead to continued or improved access to health services, better nutrition, and better overall well-being for the local community. Potential negative economic impacts associated with “boom and bust” could result in negative health impacts during closure and beyond.</td>
<td>Same as the 2021 MMP.</td>
</tr>
<tr>
<td>Changes in health metrics such as soil, air, and water quality along with resulting metal concentrations in site biota</td>
<td>Baseline air quality measurements indicate current concentrations of the criteria air pollutants are well below the NAAQS. Soil - legacy mine tailings are known to contain elevated levels of arsenic and antimony. Surface Water – The chemicals of concern for public health were arsenic, antimony, and mercury. Each of the inventoried waterbodies (except for West End Creek) are CWA Section 303(d) listed. The causes for listing of these waters are associated with arsenic, with the East Fork SF SR also being listed for antimony (downstream of Meadow Creek) and</td>
<td>Same as Baseline Condition.</td>
<td>Air - Negligible: predicted ambient air concentrations at boundary where public is allowed shown to be below NAAQS. Soil - Minor: exposures by recreationists to impacted soil materials would be of relatively low frequency, short duration, and low magnitude during construction and operations of the SGP; closure and reclamation activities assumed to lead to overall reduction in chemical impacts to surface soil. Potential negative impacts would be off-set by positive impacts from reclamation of legacy contamination. There would be a concomitant reduction in these pollutants in biota harvested from the site area. Surface Water - Negligible. Exposures are expected to be of limited magnitude and short duration. Water treatment systems and design features lead to comparable or lower</td>
<td>Same as the 2021 MMP.</td>
<td></td>
</tr>
<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
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<td></td>
<td>Sugar Creek also being listed for mercury.</td>
<td>Increased risk of natural hazards (wildfire, avalanche, landslide).</td>
<td>The entire SGP area presents potential flash-flood and debris-flow hazards that also can cause severe injury or death, or block access. Some portions of the mine site also are conducive to landslides and avalanches. Fires can cause severe injury or death for travelers, recreationists, and Forest Service and Perpetua employees, as well as damage to property.</td>
<td>Moderate</td>
<td>Moderate None of the positive impacts associated with improvement and development of the Burntlog Route. Johnson Creek Route has steeper topography and terrain and there are more areas of landslides and rockfalls along the Johnson Creek Route than there are along the Burntlog Route. Safety issues also are increased by heavy truck traffic through the Village of Yellow Pine and the general public traveling on the same road as large mining equipment.</td>
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<tr>
<td>The SGP may affect infrastructure and services as related to emergency services, medical services, law enforcement, social services, sanitation, and wastewater treatment.</td>
<td>Capacity of existing infrastructure and services to meet anticipated increased use.</td>
<td>Due to the remote nature, most of the SGP area is located more than 30 miles from the nearest local emergency services.</td>
<td>Same as Baseline Condition.</td>
<td>Moderate and positive Emergency medical technicians and emergency equipment and supplies would be on-site, including an ambulance, first aid, and medical supplies.</td>
<td>Same as the 2021 MMP.</td>
</tr>
<tr>
<td>The SGP may cause public health effects related to changing environmental conditions.</td>
<td>Disruption of recreational areas during construction, operation, and closure and reclamation.</td>
<td>Recreation is a major use throughout much of the SGP area; activities commonly include hunting, fishing, sightseeing, hiking, camping, all-terrain vehicle use, snowmobiling, and horseback riding.</td>
<td>Same as Baseline Condition.</td>
<td>Negligible Displacement of project-area recreational activities would be offset by improved access to alternative recreational areas.</td>
<td>Same as the 2021 MMP.</td>
</tr>
<tr>
<td>The SGP may cause changes to recreation setting, access, facilities, and/or opportunities.</td>
<td>Psychological effects due to noise.</td>
<td>Sound levels at the 12 baseline noise measurement locations in the SGP area ranged from 34 dBA to 64 dBA.</td>
<td>Same as Baseline Condition.</td>
<td>Negligible Predicted noise levels would be under, at, or slightly over the outdoor threshold level of 55 dBA.</td>
<td>Same as the 2021 MMP.</td>
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<td>Recreation</td>
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<td>Access to the areas/facilities accessed from Thunder Mountain Road (FR 30375) east of the SGP would be modified due to closure of Stibnite Road (CR 50-412) and creation of the Burntlog Route, which would provide motorized access (year-round) to areas that currently do not have motorized access. Winter access would be increased along Cabin Creek Road due to new OSV route. There would be direct access to Thunder Mountain Road through the SGP during operations, in addition to access via the Burntlog Route. The re-routed segment of the Burntlog Route would provide increased motorized access to areas without such access currently. Access to several OSV routes would be affected by plowing of Johnson Creek Road, Warm Lake Road, and the Burntlog Route. Construction activities for transmission lines and the maintenance facility may result in delays or detoured access.</td>
<td>Changes in motorized access (including restrictions and/or changes in maintenance) to recreation opportunities.</td>
<td>State and County roads provide access to connecting unpaved Forest Service roads, which provide access to NFS lands and facilities.</td>
<td>Current access to the area via Johnson Creek Road and Stibnite Road would remain unimpeded. In general, areas that are inaccessible to motorized vehicles would continue to be inaccessible to vehicles or certain vehicle types in summer.</td>
<td>Similar to the 2021 MMP, except there would be no Burntlog Route and resulting new motorized access to areas from these facilities. Access to several OSV routes would be affected by plowing of Johnson Creek Road and Warm Lake Road.</td>
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<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
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</tbody>
</table>
| Changes in recreation physical setting characteristics | Designated ROS classes in the analysis area vary by season, and include Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive. Estimated existing ROS physical settings are similar. | Generally, existing designated ROS classes and physical recreation setting characteristics would remain as is. Modifications to the recreation setting in the SGP area continued low level of unauthorized motorized use, and increased winter motorized access and use could lead to changes in the designated ROS class and/or ROS physical setting of some areas due to additional motorized use both in the summer and winter. | Acreage of Estimated ROS Physical Setting Classes – Summer/Winter:  
  - Primitive: 17,278/21,370 acres  
  - Semi Primitive Non-Motorized: 218,512/245,210 acres  
  - Semi-Primitive Motorized: 83,497/240,387 acres  
  - Semi-Primitive Motorized Groomed (winter only): 50,436 acres (this acreage overlaps other features)  
  - Roaded Natural: 140,594/7,511 acres  
  - Rural: 81,450/26,853 acres | Acreage of Disturbance to ROS Physical Setting Classes During Operations – Summer/Winter:  
  - Primitive: 0 acres  
  - Semi Primitive Non-Motorized: 0 acres  
  - Semi-Primitive Motorized: 42/364 acres  
  - Semi-Primitive Motorized Groomed (winter only): 163 acres  
  - Roaded Natural: 685/387 acres  
  - Rural: 345/322 acres | Similar to the 2021 MMP, except there would be no inconsistencies with existing designated ROS classes related to the Burntlog Route or plowing of the Burntlog Route. Inconsistency with the existing designated ROS class for Johnson Creek and Stibnite Roads in the winter would not be temporary during construction (as in the 2021 MMP) but would continue through operations and reclamation because the roads would be plowed as part of the Johnson Creek Route. Acreage of Estimated ROS Physical Setting Classes During Operations – Summer/Winter:  
  - Primitive: 0/0 acres  
  - Semi Primitive Non-Motorized: 0/0 acres  
  - Semi-Primitive Motorized: 43/212 acres  
  - Semi-Primitive Motorized Groomed (winter only): 113 acres  
  - Roaded Natural: 387/34/3 acres  
  - Rural: 353/53/6 acres |
| Changes in recreation facilities (trails, campgrounds, trailheads) | The Warm Lake area contains most of the developed recreation facilities (apart from trailheads). Scattered campgrounds and other facilities also are located in the Big Creek and Landmark areas and along Johnson Creek Road around and south of Yellow Pine. Developed recreation facilities primarily include campgrounds, cabins/lookouts, trailheads, and trails. | Same as Baseline Condition | The Stibnite Mining District Interpretive Site would be closed until after mine reclamation. Mine components would alter the setting of recreation facilities adjacent to them to a more developed setting due to increased man-made development, noise, traffic, etc. These components include the mine and facilities at the SGP, Burntlog Route, upgraded transmission lines, new transmission line to the SGP, Johnson Creek substation, cell tower on Meadow Creek Lookout Road, use of Warm Lake Road, and temporary use of the Johnson Creek Route. | Similar to the 2021 MMP. The Burntlog Route would not be built; therefore, there would be no resulting displacement or increase in recreation use from this route. |
| Changes in recreation use, potentially due to changes in recreation facilities, opportunities, access, and setting. | Developed recreation use is limited to the developed recreation facilities (i.e., overnight facilities) located primarily in the Warm Lake, Landmark and Johnson Creek Road areas. Most recreation in the analysis area is dispersed use, which occurs outside of developed recreation sites. | Existing recreation use would continue. Some unauthorized motorized use may continue to occur off of existing roads and motorized trails. Motorized winter use has expanded in recent years, and may continue to expand in the future, resulting in additional OSV routes and additional areas receiving winter motorized use. | There would be public access through the SGP, which may result in less displacement of use to areas/facilities accessed from Thunder Mountain Road (FR 50375). In addition, there would be less likelihood for increased dispersed recreation use along the Burntlog Route as this route would only be available for public use when the route through the SGP was closed. Some recreation use may return to the SGP area after reclamation; however, due to the changes in the recreation setting, some use may be displaced to areas where the recreation setting is more natural. | Similar to the 2021 MMP. The Burntlog Route would not be built; therefore, there would be no resulting displacement or increase in recreation use from this route. |

**Acreage of Disturbance to ROS Physical Setting Classes**

<table>
<thead>
<tr>
<th>Setting Classes – Summer/Winter</th>
<th>Acreage</th>
<th>Setting Classes – Winter Only</th>
<th>Acreage</th>
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</thead>
<tbody>
<tr>
<td>Rural</td>
<td>81,450</td>
<td>Rural</td>
<td>353</td>
</tr>
<tr>
<td>Roaded Natural</td>
<td>140,594</td>
<td>Roaded Natural</td>
<td>387</td>
</tr>
<tr>
<td>Roaded Modified</td>
<td>218,512</td>
<td>Roaded Modified</td>
<td>0</td>
</tr>
<tr>
<td>Semi-Primitive Non-Motorized</td>
<td>83,497</td>
<td>Semi-Primitive Non-Motorized</td>
<td>0</td>
</tr>
<tr>
<td>Semi-Primitive Motorized</td>
<td>240,387</td>
<td>Semi-Prototype Motorized</td>
<td>212</td>
</tr>
<tr>
<td>Semi-Primitive Motorized Groomed</td>
<td>50,436</td>
<td>Semi-Prototype Motorized Groomed</td>
<td>113</td>
</tr>
<tr>
<td>Roaded Natural</td>
<td>140,594</td>
<td>Roaded Natural</td>
<td>387</td>
</tr>
<tr>
<td>Rural</td>
<td>81,450</td>
<td>Rural</td>
<td>353</td>
</tr>
</tbody>
</table>

**Acreage of Estimated ROS Physical Setting Classes**

<table>
<thead>
<tr>
<th>Setting Classes During Operations – Summer/Winter</th>
<th>Acreage</th>
<th>Setting Classes During Operations – Winter Only</th>
<th>Acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primitive</td>
<td>0</td>
<td>Primitive</td>
<td>0</td>
</tr>
<tr>
<td>Semi Primitive Non-Motorized</td>
<td>0</td>
<td>Semi Primitive Non-Motorized</td>
<td>0</td>
</tr>
<tr>
<td>Semi-Prototype Motorized</td>
<td>43</td>
<td>Semi-Prototype Motorized</td>
<td>212</td>
</tr>
<tr>
<td>Semi-Prototype Motorized Groomed (winter only)</td>
<td>113</td>
<td>Semi-Prototype Motorized Groomed (winter only)</td>
<td>0</td>
</tr>
<tr>
<td>Roaded Natural</td>
<td>387</td>
<td>Roaded Natural</td>
<td>345</td>
</tr>
<tr>
<td>Rural</td>
<td>353</td>
<td>Rural</td>
<td>353</td>
</tr>
<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Recreation special use permit use changes due to SGP construction,</td>
<td>There are several current recreation-related special use permits in the</td>
<td>Activities, facilities, and uses allowed under current recreation-related special use</td>
<td>Construction, operations, and reclamation activities would affect access to operating</td>
</tr>
<tr>
<td>operation, or reclamation.</td>
<td>analysis area for lodges, four outfitters and guides, one bike event, two</td>
<td>permits would continue until the end of the permit term. Changes to the recreation</td>
<td>areas of three of the outfitters and guides, affect their ability to provide licensed</td>
</tr>
<tr>
<td></td>
<td>organizational camps, and 62 recreation residences.</td>
<td>setting due to additional motorized use may result in shifts in the use areas for</td>
<td>activities, and may degrade customer’s recreation experiences. Impacts to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>permittees, particularly for non-motorized uses such as trail rides, fishing,</td>
<td>outfitters and guides from the closure of Stibnite Road (CR 50-412) would not occur.</td>
</tr>
<tr>
<td>Changes in recreation opportunities available and/or the ability to</td>
<td>Recreation opportunities such as hunting, fishing, hiking, camping, and</td>
<td>Existing recreation opportunities would continue to be available. In general, areas</td>
<td>Construction activities may interfere with the bike event. Permits in the Warm Lake</td>
</tr>
<tr>
<td>participate in recreation opportunities.</td>
<td>recreation opportunities also are popular throughout the analysis area,</td>
<td>that are inaccessible to motorized vehicles would continue to be inaccessible to</td>
<td>area may be affected by traffic, noise and access changes from transmission line</td>
</tr>
<tr>
<td></td>
<td>with opportunities available at developed facilities, and at dispersed</td>
<td>vehicles or certain vehicle types in summer, both limiting the motorized recreation</td>
<td>upgrades and use of Warm Lake Road. The recreation setting of the Paradise Valley</td>
</tr>
<tr>
<td></td>
<td>locations.</td>
<td>opportunities available in some areas and preserving the setting for non-motorized</td>
<td>recreation residence tract may be affected by the Cabin Creek Road OSV route in the</td>
</tr>
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<td></td>
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<td>recreation opportunities in those areas. Motorized winter use has expanded in recent</td>
<td>winter.</td>
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<td>years, and may continue to expand in the future, resulting in additional winter</td>
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<tr>
<td></td>
<td></td>
<td>recreation opportunities.</td>
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<tr>
<td>Scenic</td>
<td>Visual contrast.</td>
<td>Landscape is characterized by valley floors surrounded by mountains with steep</td>
<td>New disturbances within the footprint of existing modifications would appear similar</td>
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<tr>
<td></td>
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<td>terrain broken up by narrow gorges and streams. Vegetation includes grass and</td>
<td>to existing modifications, but at a larger scale. Visual contrast would increase due</td>
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<td></td>
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<td>evergreens. Existing modifications include the existing historical mining</td>
<td>to a new road and larger road width, more vegetation removal, and new retaining walls.</td>
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<td></td>
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<td>disturbances at the SGP, road forest, transmission lines, and residences in the</td>
<td>A new ROW for a new transmission line segment would introduce high visual contrast. SGP</td>
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<tr>
<td></td>
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<td>western portion of the analysis area.</td>
<td>components would result in a high level of change to the characteristic landscape</td>
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<tr>
<td></td>
<td>Same as Baseline Condition.</td>
<td></td>
<td>during operations; permanent changes, although less than during operations, would result.</td>
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<tr>
<td>SGP component visibility.</td>
<td>Nighttime lighting in the analysis area is minimal and generally limited to</td>
<td>Same as Baseline Condition.</td>
<td>Changes associated with the SGP would be similar to the 2021 MMP, except there would</td>
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<tr>
<td></td>
<td>residential areas in the western portion of the analysis area.</td>
<td></td>
<td>be no visual changes from the Burntlog Route because it would not be constructed.</td>
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<td></td>
<td>Landscape changes would result from the upgrades to the Johnson Creek Route. Visual</td>
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<td>change from utilities would be the same except for additional periodic impacts from</td>
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<td></td>
<td>helicopters during construction and maintenance activity for communication</td>
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<td>repeater sites.</td>
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</tbody>
</table>
### Social and Economic

<table>
<thead>
<tr>
<th>Issue</th>
<th>Indicator</th>
<th>Baseline Conditions</th>
<th>No Action Alternative</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
</table>
| The SGP may impact the socioeconomics of Valley and Adams counties and the State of Idaho. | Total national contributions to employment levels. | No change in recent employment trends. | Same as Baseline Condition. | Employment – National Total (annual) Construction:  
  • Direct: 640  
  • Total: 4,690  
  Operations:  
  • Direct: 583  
  • Total: 2,690  
  Closure and Reclamation:  
  • Direct: 160 / 40  
  • Total: 330 / 90 | Marginally higher than 2021 MMP due to increased construction and operations spending from use of the Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction. |
| Contributions to employment levels in Idaho. | No change in recent employment trends. | Same as Baseline Condition. | Employment – Idaho (annual) Construction:  
  • Direct: 420  
  • Total: 1,820  
  Operations:  
  • Direct: 470  
  • Total: 1,150  
  Closure and Reclamation:  
  • Direct: 130 / 40  
  • Total: 190 / 60 | Marginally higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction. |
| Contributions to employment levels in Valley and Adams counties. | No change in recent employment trends. | Same as Baseline Condition. | Employment – Valley and Adams counties (annual) Construction:  
  • Direct: 190  
  • Total: 490  
  Operations:  
  • Direct: 200  
  • Total: 470  
  Closure and Reclamation:  
  • Direct: 90 / 20  
  • Total: 130 / 30 | Marginally higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction. |
| Contributions to employment levels in Valley and Adams counties. | No change in recent employment trends. | Same as Baseline Condition. | Employment – Valley and Adams counties (annual) Construction:  
  • Direct: 190  
  • Total: 490  
  Operations:  
  • Direct: 200  
  • Total: 470  
  Closure and Reclamation:  
  • Direct: 90 / 20  
  • Total: 130 / 30 | Marginally higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction. |
<table>
<thead>
<tr>
<th>Issue</th>
<th>Indicator</th>
<th>Baseline Conditions</th>
<th>No Action Alternative</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
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<tbody>
<tr>
<td>Estimated value of local income contributions.</td>
<td>No change in recent employment trends.</td>
<td>Same as Baseline Condition.</td>
<td>Income - Valley and Adams counties (annual)</td>
<td>Construction:</td>
<td>Marginaly higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction.</td>
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<td>Direct: $18.1 million/year</td>
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<td>Total: $28.1 million/year</td>
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<td>Operations:</td>
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<td>Direct: $18.7 million/year</td>
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<td>Total: $29.3 million/year</td>
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<td>Closure and Reclamation:</td>
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<td>Direct: $3.6 million/year</td>
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<td>Total: $5.3M/year</td>
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<td>Post-Closure:</td>
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<td>Direct: $0.9 million/year</td>
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<td>Total: $1.3 million/year</td>
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<tr>
<td>Estimated value of goods and services procured in Valley and Adams</td>
<td>No additional procured goods or services.</td>
<td>Same as Baseline Condition.</td>
<td>Direct Spending in Valley and Adams Counties (annual)</td>
<td>Construction:</td>
<td>Marginaly higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction.</td>
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<tr>
<td>counties.</td>
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<td>Total: $62.3 million/year</td>
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<td>Operations:</td>
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<td>Total: $60.0 million/year</td>
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<td>Closure and Reclamation:</td>
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<td>Total: $4.8 million/year</td>
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<td>Post-Closure:</td>
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<td>Direct: $0.9 million/year</td>
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<td></td>
<td></td>
<td>Total: $1.3 million/year</td>
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</tr>
<tr>
<td>Change in populations of Valley and Adams counties.</td>
<td>No change in recent population growth trends.</td>
<td>Same as Baseline Condition.</td>
<td>In-migration by workers to Valley and Adams counties</td>
<td>Construction:</td>
<td>Marginaly higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction.</td>
</tr>
<tr>
<td></td>
<td>Valley County: 0.4%/year (35 people)</td>
<td></td>
<td>SGP: 95</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Adams County: 0%/year (0 people)</td>
<td></td>
<td>Total: 198</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Operations:</td>
<td></td>
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<td></td>
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<td>Net construction change limited by local workers job transfers:</td>
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<td>SGP: 100</td>
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<td>Total: 190</td>
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<td>Closure and Reclamation:</td>
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<td></td>
<td>No in-migration</td>
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<td>Impacts to housing demand in Valley and Adams counties.</td>
<td>No increase in housing demand or population from current conditions.</td>
<td>Same as Baseline Condition.</td>
<td>Construction: Housing demand increase to accommodate estimated in-migration of 198 workers and their families (438 new residents total). Operations: Negligible net change from construction as many workers would transfer to fill the estimated 190 operating positions that would be filled by in-migration. Closure and Reclamation: No new residents.</td>
<td></td>
<td>Marginaly higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction.</td>
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<td>In-migration is likely to contribute to adverse impacts on local affordable housing availability beyond the existing prevailing factors.</td>
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<td>Marginally higher than 2021 MMP due to increased construction and operations spending from use of Johnson Creek Route. However, construction impacts spread over longer 5-year period of construction.</td>
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<td>Same as Baseline Condition.</td>
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<td>Estimated school enrollment demand increase of 80 students. If these new students are evenly distributed across grades, then the average enrollment increase per grade would be approximately six additional students in each grade. However, if in-migrating students concentrated in an area, up to six full-time equivalent teaching positions would be needed to maintain current student-teacher ratios.</td>
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<td>Same as 2021 MMP.</td>
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<td>Estimated telecommunication and internet infrastructure demand for 198 new households. Adams and Valley counties’ telecommunication and internet infrastructure operate at near capacity and, therefore, may have difficulty in maintaining service levels from increased service demand in some locations.</td>
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<td>Same as 2021 MMP.</td>
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<td>Estimated public services demand for 198 new households. Public service impacts would depend on both the location of any SGP-related population growth and the specific circumstances of the affected public services. If concentrated in individual communities such as McCall, there could be localized, long-term, substantial adverse impacts to those public services. However, if not highly concentrated, in-migration could have regional, long-term, minor or negligible adverse impacts on most of the local area’s public services.</td>
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<td>Same as 2021 MMP.</td>
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<td>Wage inflation and local worker shortages for lower paying jobs with the local area could result in adverse impacts on government provision of services contingent on the ability of agencies and contractors to backfill staff losses.</td>
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<td>Same as 2021 MMP.</td>
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<td>Total Tax Revenues (annual) Construction: State/Local: $9.3M Federal: $61.5M Operations: State/Local: $10.1M Federal: $51.6M Closure and Reclamation: State/Local: $0.4M Federal: $1.1M</td>
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<td>Same as 2021 MMP.</td>
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<td>Changes in tourism and recreational based businesses.</td>
<td>No increase in tourism sector from current conditions and trends.</td>
<td>Same as Baseline Condition; including no improvement of the lingering effects of historic mining on the environment.</td>
<td>Limited displaced recreation due to low use levels and likely local area relocation. Negligible adverse impact to local area tourism economy expected. Potential for adverse impacts to specific individual recreation businesses and/or communities.</td>
<td>Long-term traffic growth in proximity to campgrounds, dispersed camping areas, trailheads, and recreational residences would increase activity and noise which could change the recreational setting and reduce visitor recreation experience.</td>
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<tr>
<td>Changes in transportation and infrastructure.</td>
<td>No major changes expected that would result in economic activity or development changes that would substantially impact the local area’s current economic conditions.</td>
<td>Same as Baseline Condition.</td>
<td>Local area infrastructure and/or roadway use changes would not result in any major changes in economic activity or development that would result in substantial impacts on the local area’s economy.</td>
<td>The village of Yellow Pine would experience an increase in future traffic (estimated to average 60 vehicles daily) from SGP vehicle use of the Johnson Creek Route to the mine site during SGP operations.</td>
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<td>SGP mineral extraction revenue.</td>
<td>Market values of extracted minerals.</td>
<td>No mineral extraction.</td>
<td>Same as Baseline Condition.</td>
<td>SGP mineral production projected value (after refining) is approximately $7 billion over the SGP operating life.</td>
<td>Similar to 2021 MMP.</td>
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<tr>
<td>Incremental costs to the SGP as a result of proposed facility and operation modifications.</td>
<td>Changes in the SGP’s construction costs and/or future operating expenses.</td>
<td>The SGP is not built, and no mine operations occur.</td>
<td>No costs for SGP construction or future operations and maintenance (O&amp;M) expenses.</td>
<td>Total initial construction of SGP estimated to cost approximately $1.1 billion. Total annual operations estimated to cost approximately $270 million/year.</td>
<td>Marginal increase in construction costs compared to 2021 MMP from upgrade of Johnson Creek Route instead of Burntlog Route construction. SGP total construction, O&amp;M, and financial costs from use of Johnson Creek Route would increase by up to $174 million. Marginal net increase in future annual O&amp;M cost due to longer haul distances.</td>
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<tr>
<td>Values and benefits associated with ecosystem conditions including water quality and aquatic habitat. (The reader is also referred to summaries for other resource areas in this table.)</td>
<td>Removal of legacy mine tailings and waste rock. Volume and disposition of mineralized wastes from operations Fish habitat and fish population conditions.</td>
<td>Legacy mine waste in Meadow Creek valley from historical mining. SGP area streams currently provide habitat for fish species, however, barriers associated with historical mining affect volitional fish access to portions of that habitat.</td>
<td>Same as Baseline Condition.</td>
<td>Removal of legacy mine waste, management of project mineralized wastes, and active water treatment result in water quality conditions in the mine area with lower dissolved antimony and arsenic concentrations compared to baseline. These activities utilize O&amp;M expenditures during operations that continue into the post-closure period. Long term impacts to fish habitat and fish populations associated with project construction, operations, and closure. Restored fish passage to habitat available upstream of the existing Yellow Pine pit.</td>
<td>Similar to 2021 MMP.</td>
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<tr>
<td>Impacts to an IRA from SGP construction and operations</td>
<td>Roadless characteristics</td>
<td>There is an existing IRA in the vicinity of the proposed Burntlog Route</td>
<td>Same as Baseline Condition.</td>
<td>Development and use of the Burntlog Route would affect roadless characteristics in three IRAs.</td>
<td>The use of the Johnson Creek Route would not incur any impacts to roadless area characteristics that would be associated with the construction of the Burntlog Route.</td>
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</table>

**Environmental Justice**

<p>| The SGP may disproportionately affect minority or low-income populations. | Number and size of minority populations affected. | The Nez Perce Census County Subdivision, Duck Valley Indian Reservation, and Fort Hall Reservation meet the definition of minority populations. | Same as Baseline Condition. | There are no minority communities within the SGP area. There would be no direct effect to reservation lands and their Tribal minority populations that are outside of the SGP area, but there would potentially be indirect effects. | Same as 2021 MMP. |</p>
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<td>Number and size of low-income populations affected.</td>
<td>The Duck Valley Indian Reservation (1,353 residents) meets the definition</td>
<td>Same as Baseline Condition.</td>
<td>There are no low-income communities within the SGP area.</td>
<td>There would be no direct effect to Duck Valley Indian Reservation lands and their Tribal low-income populations that are outside of the SGP area, but there would potentially be indirect effects.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Location of SGP facilities, including roads and transmission lines in relation to minority or low-income residents.</td>
<td>There are no environmental justice communities in the SGP area.</td>
<td>Same as Baseline Condition.</td>
<td>There would be no direct effect of SGP facilities on environmental justice communities.</td>
<td>None of the SGP facilities would be on reservation lands; therefore, there would be no direct effect of SGP facilities on Tribal environmental justice communities.</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Differences in access to public lands.</td>
<td>Public and Tribal member access is available throughout the SGP area except in areas previously used for mining. There are no minority and low-income populations in the SGP area that would be affected by differences in public and Tribal member access. Tribal members use public lands within the PNF and BNF to access cultural and subsistence resource areas.</td>
<td>Same as Baseline Condition.</td>
<td>Construction and operations could impact access to traditional use areas and subsistence resources through habitat loss; behavioral disturbance to resources from increased noise and human activity; and concerns about contamination of resources. Burntlog Route and new OSV groomed trails would provide new and/or improved access to the SGP area and vicinity, which could have a positive impact by providing motorized access to cultural sites and subsistence resources. Public and Tribal member access also would be provided through the mine site by constructing new road to link Stibnite Road to Thunder Mountain Road. Access and use increases could result in potential indirect adverse impacts to Tribal members due to increased human activity.</td>
<td>Same as 2021 MMP, except for: No new and/or improved access from construction or use of the Burntlog Route. Upgrades to Johnson Creek Route and use of Warm Lake, Johnson Creek, and Stibnite roads as the primary access route to the mine site would result in greater impacts to Tribal environmental justice communities.</td>
<td>Same as 2021 MMP.</td>
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<td>Change in traditional Tribal practices and/or access to Tribal resources.</td>
<td>Tribal access and use of the region have long-standing and on-going current cultural importance and subsistence value for many Tribal members.</td>
<td>Same as Baseline Condition.</td>
<td>Restricted access to traditional use areas would occur in the 14,221 acres of public lands within the Operations Area Boundary. Additional use of the area caused by road improvements could impact Tribal members by potentially increasing unauthorized motorized use, causing distractions, and changing natural conditions of traditional Tribal practices.</td>
<td>Same as 2021 MMP.</td>
<td>Same as 2021 MMP.</td>
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<td>Change in traditional Tribal practices and/or access to sacred sites.</td>
<td>Based on ethnographic information received from the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes, sacred sites do exist in the analysis area, although exact locations are not public information.</td>
<td>There would be no potential impact to sites of cultural significance.</td>
<td>Specific information from the Tribes regarding the exact nature, duration, and location of impacts on sacred sites is confidential. Based on the information provided to the Forest Service by the Tribes, it is expected that the SGP-related impacts would be of a type and/or magnitude to represent an adverse environmental justice impact to the Tribal environmental justice communities.</td>
<td>Same as 2021 MMP.</td>
<td>Same as 2021 MMP.</td>
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**Special Designations**

- **The SGP could change the quality of wilderness character in designated or recommended wilderness areas.**
- **Distance of SGP facilities from designated or recommended wilderness.**
- **The FCRNRW and recommended wilderness areas contain diverse vegetation and wildlife species.**
- **Vegetation varies from ponderosa pine/bluebunch wheatgrass or Idaho fescue, and Douglas- fir/ninebark or snowberry at lower elevations, to**
- **Surface disturbance and vehicles used during the 2 years to construct Burntlog Route would increase the potential for non-native plant species to spread into the FCRNRW. Construction and maintenance of approximately 1.3 miles of the Burntlog Route between 170 and 300 feet of the FCRNRW boundary could result in sediment deposited in the headwater tributaries to Big Chief Creek. Disturbance from the cut and fill slopes on approximately 5.3 miles of Burntlog**
- **Using the Johnson Creek Route for mine access during the 15 years of**
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<td>near-alpine habitat in the highest elevation areas. Wildfires have continually altered the wilderness landscape, creating brush fields, large lodgepole pine stands, extensive snag patches, and variations in species and age classes of vegetation.</td>
<td>Route in the headwaters of Riordan Creek would increase the risk of non-native plant species spreading into the FCRNRW. The use of the Johnson Creek Route during construction and construction of the Burntlog Route could disturb wildlife and change the distribution of big game within the FCRNRW. During the 3 years of construction, the increase in human activity near the western FCRNRW boundary could change ecological processes in areas where non-native plant species establish. During the 15 years of operation, mine traffic and recreation use on the Burntlog Route could increase the potential for non-native plant species to spread into the FCRNRW. Where established, non-native plants could alter ecological processes. The 50 vehicles per day, the Burntlog Route road maintenance, and recreation use of access roads adjacent to the FCRNRW would create additional opportunities for solitude within the FCRNRW.</td>
<td>mine operation would reduce the miles of road near the FCRNRW and reduce the potential for non-native plant species to spread into the FCRNRW. Mine vehicles and recreation use would be on existing roads. The use of existing roads for mine traffic would reduce the area adjacent to the FCRNRW where vehicle traffic could disturb big game species. Surface disturbance from mineral exploration, reseeding disturbed areas, and monitoring activities would be 3 miles from the FCRNRW boundary. The natural quality of wilderness character would be the same as existing conditions.</td>
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<td>The SGP could change the quality of wilderness character in designated or recommended wilderness areas.</td>
<td>Distance of designated or recommended wilderness from sights and sounds of human activity from SGP activities.</td>
<td>The FCRNRW and recommended wilderness areas contain diverse vegetation and wildlife species. Vegetation varies from ponderosa pine/bluebunch wheatgrass or Idaho fescue, and Douglas- fir/ninebark or alpine meadow/Idaho fescue. Large lodgepole pine stands, extensive snag patches, and variations in species and age classes of vegetation.</td>
<td>Sights and sounds of human activity from mineral exploration and monitoring activities would be 3 miles from the FCRNRW boundary.</td>
<td>Noise from the construction of the Burntlog Route would be audible along the boundary of the FCRNRW. Decreasing the distance between the Burntlog Route and the FCRNRW boundary would increase the area where noise from construction activities would be audible. Noise from road maintenance activities and recontouring slopes during closure on the Burntlog Route could be heard along the boundary of the FCRNRW depending upon topography and weather conditions and would reduce opportunities for solitude within the FCRNRW.</td>
<td>Using the Johnson Creek Route during construction, operation, and closure and reclamation would eliminate impacts on the FCRNRW associated with the Burntlog Route.</td>
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<td>Reduced opportunities for self-reliant recreation within designated or recommended wilderness.</td>
<td>The FCRNRW and recommended wilderness areas provide opportunities for solitude and primitive recreation.</td>
<td>Opportunities for solitude would be the same as existing conditions.</td>
<td>The decreased distance between the Burntlog Route and the FCRNRW boundary would increase the area where noise from SGP activities is audible. The extent where noise is audible would reduce opportunities for solitude within the FCRNRW. If wilderness visitors avoid the FCRNRW areas accessed through the SGP or adjacent to the Burntlog Route, increased recreation in recommended wilderness areas could reduce opportunities for solitude within the FCRNRW.</td>
<td>Using the Johnson Creek Route during construction, operation, and closure and reclamation would eliminate impacts on the FCRNRW associated with the Burntlog Route. Using Johnson Creek Route during the 15 years of mine operation could increase wilderness visits to recommended wilderness areas or other areas of the FCRNRW.</td>
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<td>The SGP may affect the value of eligible or suitable WSRs.</td>
<td>Impacts to free-flowing characteristics of eligible and suitable WSRs.</td>
<td>Free-flowing conditions currently not impacted.</td>
<td>Same as Baseline Condition</td>
<td>Same as Baseline Condition</td>
<td>Same as the 2021 MMP.</td>
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<td>Impacts to water quality of eligible, suitable, and designated WSRs.</td>
<td>Water quality to improve as a result of improved management, site cleanups, and watershed restoration projects.</td>
<td>Water quality to improve as a result of improved management, site cleanups, and watershed restoration projects.</td>
<td>Area-wide water quality to improve, except for Burntlog Creek where water quality may be adversely impacted. Erosion and sediment control BMPs would reduce water quality impacts.</td>
<td>Area-wide water quality to improve, except for Johnson Creek where water quality may be adversely impacted. Erosion and sediment control BMPs would reduce water quality impacts.</td>
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<td>Impacts to ORVs for which eligible, suitable, and designated WSRs are recognized.</td>
<td>Heritage ORVs likely to decline over time. Fish ORVs anticipated to remain stable or improve.</td>
<td>Heritage ORVs likely to naturally decline over time. Fish ORVs anticipated to remain stable or improve.</td>
<td>Heritage ORVs likely to naturally decline over time and historic properties could be impacted. Fish ORVs anticipated to remain stable or improve, with possible exception of Burntlog Creek.</td>
<td>Heritage ORVs similar to the 2021 MMP. Fish ORVs anticipated to remain stable or improve, with possible exception of Johnson Creek.</td>
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<td>Impacts to the preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs.</td>
<td>No impacts to preliminary Wild, Scenic or Recreational classifications anticipated.</td>
<td>No impacts to preliminary Wild, Scenic, or Recreational classifications anticipated.</td>
<td>Likely impacts to Wild classification of Burntlog Creek, possible impacts to recreation access to Burntlog Creek.</td>
<td>No impacts to preliminary Wild, Scenic, or Recreational classifications anticipated.</td>
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<td>The SGP may impact roadless character in IRAs and lands contiguous to unroaded areas.</td>
<td>Miles and acres of new roads in IRAs or contiguous unroaded lands.</td>
<td>Thirteen IRAs within the analysis area are managed for roadless character.</td>
<td>No new roads within IRAs.</td>
<td>During construction and mine operation, new disturbance would occur within five IRAs (Meadow Creek, Horse Heaven, Black Lake, Burnt Log, and Reeves Creek). Within the Meadow Creek, Black Lake, and Burnt Log IRAs, soil nail walls would be constructed in association with the Burntlog Route and after mine closure, retaining walls would remain within the IRAs.</td>
<td>No access roads within IRAs.</td>
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<td>Number and acres of SGP facilities in IRAs or contiguous unroaded lands.</td>
<td>Thirteen IRAs within the analysis area are managed for roadless character.</td>
<td>No new facilities within IRAs.</td>
<td>Total of 674 acres of SGP facilities within six IRAs (Meadow Creek, Horse Heaven, Black Lake, Burnt Log, Caton Lake, and Reeves Creek). After mine closure, the TSF and TSF Buttress would remain in the Meadow Creek and Horse Heaven IRAs.</td>
<td>A reduction of approximately 200 acres of SGP facilities within four IRAs (Meadow Creek, Horse Heaven, Caton Lake, and Reeves Creek) would occur. After mine closure, the TSF and TSF Buttress would remain in the Meadow Creek and Horse Heaven IRAs.</td>
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The SGP could impact research values or ecosystem conditions within RNAs. Change in vegetation community composition and structure within an RNA. Change in number of vehicles using roads and human activity within or immediately adjacent to an RNA. Changes to water quality (chemistry, temperature) or quantity within an RNA.

The six RNAs within the analysis area provide opportunities to conduct research and provide a control site to evaluate ecological conditions and processes within the Intermountain West. Surface exploration and seeding of disturbed areas at the SGP would be over 5 miles from the six RNAs. The research values and ecological site conditions within the RNAs would be the same as existing conditions.

Areas where non-native plant species become established would reduce the Chilcoot Peak RNA values in the long term. Changes to the vegetation community composition would result in a loss of research values and ecological conditions within an RNA. Dust deposited on vegetation could change vegetation conditions and ecological processes within the Chilcoot Peak RNA. Human caused fire ignitions that spread into the Chilcoot Peak RNA could change the existing fire regime and reduce the RNA’s research values related to ecological process. Indirectly, if forest visitors avoid areas near the Burntlog Route or the SGP there could be an increase in recreation use on trails and roads adjacent to an RNA. Culverts along a segment of FR 447 of the Burntlog Route could change the movement of sediment, woody debris, and other organic material. Additional culverts installed along the Burntlog Route could indirectly change local hydrologic conditions within the Chilcoot Peak RNA and alter ecological processes long term. Changes in ecological processes would reduce the Chilcoot Peak RNA values.

The use of the Johnson Creek Route for mine access could increase recreation use along the South Fork Salmon River and Big Creek drainages from forest visitors avoiding the SGP. Increased recreation use on trails could increase the potential for non-native invasive plant species into RNAs. The potential loss of RNA values could be less than the 2021 MMP as the roads and trails open to public use are several miles from the closest RNA. The Johnson Creek Route Alternative would occur farther away from the Chilcoot Peak RNA. Potential impacts to the Chilcoot Peak RNA would be fewer and of lesser intensity under this alternative.

Tribal Rights and Interest

The SGP would impact tribal resources, restrict tribal access, and reduce viability and/or availability of culturally significant fish, wildlife, and plants. Presence of TCPs, CLs, sacred sites or places, and resource harvesting and gathering areas impacted by an increase in ground disturbance.

Tribal resource harvesting and gathering areas and traditional use sites are in the analysis area, including the Old Thunder Mountain Road (FR 440) travel route, portions of the historic Burnt Log Road travel route, the Johnson Creek Road travel route, the East Fork SFSR watershed system associated with a potentially eligible TCP District historic property, and the Riordan Lake shore. Ground disturbance is currently from approved activities confined to a small area of private and NFS lands and use of existing roads and facilities.

Ground disturbance would increase over baseline and would physically impact the East Fork SFSR watershed system, plus an undisclosed number of other tribal resources, such as tribal travel routes along the Burntlog Route.

The use of the Johnson Creek Route Alternative for mine access could increase recreation use along the South Fork Salmon River and Big Creek drainages from forest visitors avoiding the SGP. Increased recreation use on trails could increase the potential for non-native invasive plant species into RNAs. The potential loss of RNA values could be less than the 2021 MMP as the roads and trails open to public use are several miles from the closest RNA. The Johnson Creek Route Alternative would occur farther away from the Chilcoot Peak RNA. Potential impacts to the Chilcoot Peak RNA would be fewer and of lesser intensity under this alternative.
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<td>Presence of TCPs, CLs, sacred sites or places, and resource harvesting and gathering areas impacted by an increase in audible elements (noise and vibrations).</td>
<td>Tribal resource harvesting or gathering areas and traditional use sites are in the analysis area, including the Old Thunder Mountain Road (FR 440) travel route, Burnt Log Road travel route, the Johnson Creek Road travel route, the East Fork SFSR watershed system associated with a potentially eligible TCP District historic property, and the Riordan Lake shore. Currently the only noise and vibrations disturbance is from approved activities, including underground exploration on private land, with occasional blasting (short-term high noise levels and ground vibrations).</td>
<td>Same as baseline conditions.</td>
<td>Noise and vibrations would increase and include blasting, drilling, and ore crushing at the mine site; temporary increases during construction; and increases due to use of roads during construction and operations (Forest Service 2022h). The increase in noise and vibrations would likely be perceived by tribal members as a reduction in the integrity of setting and solitude and may discourage or detract from potential TCPs, CLs, sacred sites or places, and tribal use of traditional areas.</td>
<td>Same as 2021 MMP except: Upgrades to Johnson Creek Route and use of Johnson Creek and Stibnite roads as the primary route to the mine site for the life of the SGP would result in greater impacts to tribal resources, including the Johnson Creek Road travel route, along these roads due to increased noise and traffic. The Burninglog Route would not be constructed, therefore there would be no noise and vibrations related to construction, use, and maintenance of that route.</td>
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<tr>
<td>Presence of TCPs, CLs, sacred sites or places, and resource harvesting and gathering areas impacted by the visual range of new tall or massive SGP components.</td>
<td>Tribal resource collection areas and traditional use sites are in the analysis area, including the Old Thunder Mountain Road (FR 440), the East Fork SFSR system, and the Riordan Lake shore. The Yellow Pine pit and tailings piles from historical mining activities are present along with a large, capped heap leach pile from mining in the 1980s. The transmission line already exists between Cascade and the village of Yellow Pine.</td>
<td>Same as baseline conditions.</td>
<td>The 2021 MMP would include increased visual components through new open pits, a TSF, and TSF Butteress; new access routes; and a segment of new transmission line. The viewsheds of portions of the East Fork SFSR watershed system, Riordan Lake, and the Old Thunder Mountain Road travel route, would be altered (Forest Service 2022i). The increase in visual impacts likely would be perceived by tribal members as a reduction in the integrity of setting and solitude and may discourage or detract from potential TCPs, CLs, sacred sites or places, and tribal use of traditional areas.</td>
<td>Same as 2021 MMP, except: Johnson Creek Route Alternative would not include the Burninglog Route, which would reduce visual effects at Riordan Lake and other traditional use areas along that route. Addition of potential impacts to the Johnson Creek Road travel route.</td>
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<td>Changes in tribal access due to the restricted access to Operations Area Boundary.</td>
<td>Tribal access and use of the region has had long-standing and on-going cultural importance and subsistence value. Currently there is no restricted access on NFS lands in the SGP area. Some restrictions are in place on private lands.</td>
<td>Same as baseline conditions.</td>
<td>The SGP would restrict tribal access to 14,221 acres within theOperations Area Boundary, potentially restricting access to usual and accustomed fishing places, streams and fountains, and potential TCPs, CLs, sacred sites or places within that area. However, public and tribal access would be provided through the mine site (Forest Service 2022h). Impact would be localized, long term, and moderate to major. Burninglog Route and new over-snow vehicle groomed trails would provide new and/or improved access to the SGP mine area and vicinity, including the Riordan Lake area and FCNWR, which could have a negative impact to tribal members if there is an actual or perceived decrease in their access to, availability, and/or quality of tribal resources or a positive impact by providing Tribes year-round access to previously inaccessible traditional use areas. Length of time of restricted access is 20 years. This could result in loss of tribal cultural practices important to tribal identity.</td>
<td>Same as 2021 MMP, except: Burninglog Route would not be constructed. Addition of potential impacts to the Johnson Creek Road travel route Stibnite Road would not be returned to its pre-mining width and traffic would be greatly reduced. This could encourage use of tribal resources east of the mine.</td>
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<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
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<td>Changes to water quality and quantity of both surface water and groundwater in relation to how it affects wildlife, fisheries, vegetation, or other resources.</td>
<td>The East Fork SFSR watershed supports wildlife, wildlife habitat, and fisheries. The 1863 Treaty with the Nez Perce Tribe reserved the use of springs and fountains including perpetual rights-of-way to and from them.</td>
<td>Same as baseline conditions.</td>
<td>Long-term reduction in flows of streams, springs, and seeps receiving groundwater recharge. Water quality of surface flow departing from the Operations Area Boundary would be the same or better than baseline conditions (Forest Service 2022c). Surface water available for tribal use in the area would not be impacted above human drinking water standards by the SGP.</td>
<td>Same as 2021 MMP.</td>
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<td>Changes to species viability and/or availability for tribal harvest of fish.</td>
<td>Tribes fish, hunt, and gather plants in the SGP area. Currently the Yellow Pine pit passage barrier blocks fish passage, and there are legacy chemical contaminants in downstream waters from historic mining. The SFSR and tributaries are an aquatic stronghold and recovery area for fish species of cultural significance. Tribes are managing fish and restoring habitat within this area.</td>
<td>Same as baseline conditions.</td>
<td>The SGP would affect fish and fish habitat through stream channel changes, increased stream temperature, loss of habitat, and behavioral changes (Forest Service 2022c). This could impact a Tribe’s ability to harvest fish in their usual and accustomed fishing places. Population-level effects are not expected from construction, but after reclamation the net effect would be: A loss of habitat quality and quantity for Chinook salmon, bull trout, and cutthroat trout. A net gain of habitat quality and quantity for steelhead trout. Water quality improvements from removal of legacy mine materials would partially, but not completely, offset geochemical impacts associated with the SGP (Forest Service 2022c). Use of Johnson Creek Route during construction, may impede tribal fisheries restoration activities along Johnson Creek road.</td>
<td>Same as 2021 MMP, except: A loss of habitat quality and quantity of habitat for steelhead trout. Use of Johnson Creek Route for the life of the mine (approximately 20 years), may impede tribal fisheries restoration activities along Johnson Creek road.</td>
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<tr>
<td>Changes to species viability and/or availability for tribal harvest of wildlife.</td>
<td>Tribes fish, hunt, and gather plants in the SGP area.</td>
<td>Same as baseline conditions.</td>
<td>The SGP would affect wildlife, including special-status species and species of cultural importance, through loss of habitat (Forest Service 2022g). Loss of habitat may in turn impact a Tribe’s ability to harvest and manage their traditional wildlife resources in the SGP area. Ground disturbance/Direct habitat impacts: 3,266 acres.</td>
<td>Same as 2021 MMP, except: Ground disturbance/Direct habitat impacts: 3,095 acres. Burntlog Route would not be constructed, therefore no habitat fragmentation or wildlife displacement in this area.</td>
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<tr>
<td>Changes to species viability and/or availability for tribal harvest of plants.</td>
<td>Tribes fish, hunt, and gather plants in the SGP area.</td>
<td>Same as baseline conditions.</td>
<td>The SGP would affect plant species of cultural importance through varying degrees of impacts to vegetation and special status plants that would contribute to an adverse cumulative impact on these resources (Forest Service 2022f). Loss of habitat may in turn impact a Tribe’s ability to harvest and manage their traditional plant resources in the SGP area. Revegetation in these areas would contribute to cumulative benefits, including ability of Tribes to harvest and manage their traditional plant resources in the SGP area. Acres of vegetation disturbance/clearing: 3,562 acres.</td>
<td>Same as 2021 MMP, except: Acres of vegetation disturbance/clearing: 3,269 acres.</td>
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<td>Acres of access and traditional use areas that would be unavailable for the duration of mining activities to exercise treaty rights.</td>
<td>Tribes access their usual and accustomed fishing places, hunting areas, and plant gathering areas consistent with their reserved rights.</td>
<td>Same as baseline conditions.</td>
<td>The long-term loss of approximately 13,441 acres of federal land within the Operations Area Boundary: A localized, long-term, and moderate to major impact for access to specific use areas. Public and tribal access would be provided through the mine site (Forest Service 2022b).</td>
<td>Same as 2021 MMP.</td>
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<tr>
<td>Issue</td>
<td>Indicator</td>
<td>Baseline Conditions</td>
<td>No Action Alternative</td>
<td>2021 MMP</td>
<td>Johnson Creek Route Alternative</td>
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<td>Known archaeological, cultural resource, and traditional use sites impacted by the Project and visibility of disturbances to these areas.</td>
<td>15 pre-contact archaeological resources within the physical APE for heritage resources. An additional 21 pre-contact archaeological resources are within the greater visual, auditory, vibratory APE.</td>
<td>Same as baseline conditions.</td>
<td>Operations Area Boundary – 1 pre-contact site to be avoided by protective measures. Burntlog Route - intersects 2 tribal travel routes Transmission Line upgrade – 4 pre-contact sites to be avoided by design or protective measures. The impact to tribal historical and archaeological sites would be localized, temporary to permanent, and negligible to minor.</td>
<td>Same as 2021 MMP except: Tribal travel routes not intersected by Burntlog Route access road.</td>
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<td>Changes in air quality in relation to how that affects wildlife, fisheries, and vegetation, or visibility impacts from fugitive emissions to areas of tribal importance.</td>
<td>Air quality is designated as in attainment for all NAAQS and Idaho Ambient Air Quality Standards.</td>
<td>Same as baseline conditions.</td>
<td>Air quality impacts would not exceed NAAQS. Impacts to tribal treaty rights and tribal resources due to haze would be localized, long term, and negligible to minor.</td>
<td>Same as the 2021 MMP.</td>
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3.0 AFFECTED ENVIRONMENT

3.1 Introduction

Chapter 3 describes the existing natural and human environment that would potentially be affected by the SGP. The natural and human environment is further divided into resources or resource uses - physical environment, biological resources, and social resources/environment. Each resource section is organized as follows: a brief introduction and scope of analysis including a definition of the analysis area specific to the resource; relevant laws, regulations and policies; and existing conditions of the resource in the analysis area.

This SDEIS is purposely designed to efficiently detail what is necessary in order to understand the affected environment and environmental effects related to the alternatives that are evaluated. Many of the subsections of this SDEIS summarize more detailed information that is discussed in specialist reports which are cited in the subsections. These reports include any information that has become available since the DEIS was released in August 2020. Readers who are interested in reviewing the more detailed information may download the specialist reports of interest from the same website hosting this SDEIS. The specialist reports that are available include:

- Air Quality Specialist Report (Forest Service 2022a)
- Climate Change Specialist Report (Forest Service 2022b)
- Soils and Reclamation Cover Materials Specialist Report (Forest Service 2022c)
- Noise Specialist Report (Forest Service 2022d)
- Surface Water and Groundwater Quantity Specialist Report (Forest Service 2022e)
- Surface Water and Groundwater Quality Specialist Report (Forest Service 2022f)
- Vegetation: General Vegetation Communities, Botanical Resources, and Non-Native Plants Specialist Report (Forest Service 2022g)
- Wetland and Riparian Resources Specialist Report (Forest Service 2022h)
- Fisheries and Aquatic Habitat Including Threatened, Endangered, Proposed, and Sensitive Species Specialist Report (Forest Service 2022i)
- Wildlife and Wildlife Habitat Including Threatened, Endangered, Candidate, and Sensitive Species Specialist Report (Forest Service 2022j)
- Access and Transportation Specialist Report (Forest Service 2022k)
- Heritage Resources Specialist Report (Forest Service 2022l)
- Recreation Specialist Report (Forest Service 2022m)
- Scenic Resources Specialist Report (Forest Service 2022n)
- Social and Economic Conditions Specialist Report (Forest Service 2022o)
- Special Designations Specialist Report (Forest Service 2022p)
- Tribal Rights and Interests Specialist Report (Forest Service 2022q)
Certain of the environmental resources evaluated in this SDEIS are essentially unchanged from 2020 so specialist reports were not prepared for these resources, which include: geology, hazardous materials, environmental justice, timber, land use, and public health and safety.

3.1.1 Scope of Analysis

For the purposes of this EIS, the term “SGP area” is defined to mean the entire area in which disturbance from the SGP components (i.e., the combined disturbance footprints of the mine site, access roads, utilities, and offsite facilities) for any alternatives would occur.

The analysis area varies by resource or resource use, depending on the geographic extent of the resource or use and the extent of the potential effects of the SGP. In some cases, the analysis area is the SGP area and other cases, the analysis area may be larger or smaller than the SGP area, encompassing administrative or natural boundaries, because the potential effects on the resource can either extend beyond the SGP area boundary or may only occur in a smaller area such as the mine site.

3.1.2 Relevant Laws, Regulations, Policies, and Plans

Each resource section briefly summarizes applicable laws, regulations, policies and plans that pertain specifically to the resource being described and why each is relevant to the resource. This document is prepared pursuant to NEPA, and NEPA and its implementing regulations apply to the evaluation of alternatives and environmental effects with respect to each resource in this document. Further references to NEPA in particular resource sections focus on particular provisions that may apply to that specific resource.

The Payette Forest Plan and the Boise Forest Plan are applicable to most of the environmental resources evaluated and provide guidance on NFS lands in the SGP area. The forest plans have both forest-wide management directions and more specific management area level directions such as Management Prescription Categories (MPCs). These management areas are organized around a combination of watershed and administrative boundaries and are designed to tier to the forest-wide direction to help achieve forest-wide goals and desired conditions.

3.1.3 Existing Conditions

The existing conditions section for each resource describes the potentially affected resources (i.e., physical, biological, social and economic resources or resource uses) qualitatively and/or quantitatively, depending on the analysis requirements identified by the issues and indicators.

The mine site is within terrain consisting of narrow valleys surrounded by steep mountains. Elevations along valley floors range from 6,000 to 6,600 feet amsl. The surrounding mountains reach elevations over 8,500 feet amsl. The main drainage basin at the mine site is the East Fork SFSR. More detailed descriptions of the physical, biological, and social environments are included in the resource sections in the rest of this chapter.
3.2 Geologic Resources and Geotechnical Hazards

3.2.1 Introduction

This section describes the geologic resources and geotechnical hazards at and in the vicinity of the SGP area (Figure 3.2-1). The analysis area for geologic resources includes the footprint of disturbance of all SGP components. Geologic resources as they pertain to this project include bedrock (e.g., ore bodies and development rock) and overburden (e.g., glacially derived sediments, alluvium). Regional geology and seismicity are discussed to provide context to the site-specific features. For purposes of the SGP, the description of existing geotechnical hazards include existing or potential mass wasting features (e.g., landslide, rockfall, avalanche paths) and focuses on the Operation Area Boundary, access road areas, and the areas where the transmission lines would be upgraded and/or new transmission line would be built. In the context of the mine site, geotechnical hazards are described and considered with a focus on three proposed component locations: open pits, the TSF, and the TSF buttress.

3.2.2 Geologic Resources and Geotechnical Hazards Area of Analysis

The geological resources and Geotechnical Hazards analysis area is within the Salmon River Mountains, a high-relief mountainous physiographic province in central Idaho. The Analysis Area consists of the footprint of the proposed SGP disturbance area (as depicted on Figure 2.4-2) where potential impacts to Geologic Resources and Geotechnical Hazards may take place. The generalized geology and project components are shown on Figure 3.2-2.

3.2.3 Relevant Laws, Regulations and Policy

Several laws and implementing regulations apply to the Proposed Action and alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to geological resources and geotechnical hazards.

1872 Mining Law (as Amended) - The statutory right to search for, develop, and extract mineral deposits on federal lands open to mineral entry was established by the Mining Law and later legislation. These rights include the right to initially locate a mining claim and the right to reasonable access to the claim for further exploration, mining, or necessary ancillary activities, consistent with the Mining and Mineral Policy Act of 1970 (30 United States Code [USC] 21a) and other applicable laws.

Paleontological Resources Preservation Act of 2009 - Paleontological resources are managed and protected under the federal Paleontological Resources Preservation Act of 2009 (Public Law 111-11, Subtitle D). The Paleontological Resources Preservation Act defines paleontological resources (with certain exceptions) as “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust that are of paleontological interest and that provide information about the history of life on earth...” (16 USC 470aaa(4)).

Cave Resources Protection Act of 1988 - Caves and karst formations are protected and managed by the 1988 Federal Cave Resources Protection Act (16 U.S.C § 4301 et seq.).
Mine Safety and Health Act of 1977 - The Mine Safety and Health Act of 1977, as amended (P.L. 91-173 as amended by 95-164) established mandatory health and safety standards for coal and other mines in the U.S. The act and regulations are administered by the MSHA of the U.S. Department of Labor. The MSHA standards and regulations are in Title 30 of the CFR, Mineral Resources, Chapter I. There are federal health and safety standards for all aspects of surface and underground mine operations applicable to: facility designs, methods, equipment characteristics, work practices, inspections, and reporting.

Federal Emergency Management Agency (FEMA) National Dam Safety Program (NDSP) - The FEMA has developed the NDSP, which includes standards that are applicable to structures constructed on federal land, including tailings storage facility embankments (i.e., dams). The NDSP provides a conceptual framework that includes requirements for site investigation and design, construction oversight, operations and maintenance, and emergency planning.

The NDSP is a partnership of states, federal agencies (including Forest Service), and other stakeholders to encourage and promote the establishment and maintenance of effective federal and state dam safety programs to reduce the risk to human life, property, and the environment from dam-related hazards. The NDSP includes federal recommendations for dams related to risk management, emergency action planning, flood risks, design inflows, seismic analysis and design, and general dam safety. The state, IDWR specifically, is responsible for reviewing and approving the design and specifications for TSFs.

Forest Service Mining regulations at 36 CFR 228 - Mining activities on federal land administered by the U.S. Forest Service are regulated under the Forest Service Mining Regulations at (36 CFR 228). Locatable minerals operations such as the SGP are regulated under Subpart A. Large mine operations are required to submit a proposed Plan of Operations describing all aspects of the proposed mine operations.

The regulations at Section 228.8 contain requirements for environmental protection and generally require, where feasible, that environmental impacts to Forest Service-administered resources be minimized. These regulations specifically note requirements related to air quality, water quality, solid wastes, scenic values, fisheries and wildlife habitat, and roads. Section 228.8(c) requires that tailings and other wastes produced by mine operations be handled to minimize adverse impacts to the environment. Section 228.8(g) requires reclamation of areas disturbed in operations to prevent or control onsite and off-site damage to the environment and forest service resources. These rules specifically refer to control of erosion and landslides and isolation or control of toxic materials.

Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a) - Physical, social, and biological resources on NFS lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. National Forest Land and Resource Management Plans embody the provisions of the National Forest Management Act of 1976 (NFMA) and guide natural resource management activities on NFS land.

In the SGP area, the Resource Management Plans provide management prescriptions designed to realize goals for achieving desired condition for geologic resources and geotechnical hazards and include various objectives, guidelines, and standards for this purpose.
Idaho Department of Lands Rules - Surface mining is regulated by the IDL through the Mined Land Reclamation Act, codified as Idaho Code Title 47, Chapter 15. The Mine Land Reclamation Act requires reclamation of affected land to return them to a productive condition. The IDL regulatory oversight includes mining and other activities on private and patented land, as well as on public lands under federal ownership and/or surface management.

Idaho Department of Water Resources Rules - Idaho dam safety statutes are enumerated in Section 42-1709 through Section 42-1721 of the Idaho Code. Mine tailings impoundment structures greater than or equal to 30 feet high are regulated by the IDWR in the same manner as water storage projects, with an additional provision that a surety bond be secured by the owner, payable to IDWR to ensure the TSF is placed in a safe and maintenance-free condition upon decommissioning.

Idaho Administrative Rules under Idaho Administrative Procedure Act (IDAPA; 58.01.13) - Rules governing mined land reclamation are described in Section 20.03.02 of the IDAPA regulations. Design and construction requirements for Mine Tailings Impoundment Structures are described in the IDAPA Section 37.03.05, while Section 37.03.06 describes rules for the safety of dams. The IDAPA 58 Current Administrative Rules (58.01.13) address ore processing by cyanidation and would apply because these rules are relevant to tailings dams, pipeline, and process ponds if they contain cyanide process water. Idaho Code § 42-1711; Idaho Administrative Procedure Act (“IDAPA”) 37.03.05.40.

Valley County Code - No specific Valley County regulations exist regarding geotechnical issues at mines or geological resources and hazards. However, Valley County has pertinent sections in their ordinances that relates to flood control and land use that may apply to the SGP. Title 11, Chapter 1, Valley County Code of Ordinances.

3.2.4 Affected Environment

3.2.4.1 Geologic Setting

The geological resources analysis area is within the Salmon River Mountains, a high-relief mountainous physiographic province in central Idaho. The legacy mine site has undergone extensive ground disturbing activities associated with past mineral development spanning more than a century (i.e., legacy mining features).

Bedrock Geology, Lithology, and Stratigraphy

Several studies have described the lithologic characteristics and stratigraphy of the intrusive, metasedimentary, volcanic, and unconsolidated rocks exposed in the analysis area. The descriptions that follow are derived from relevant sources as well as from unpublished studies by past operators, Perpetua, and Perpetua contractors and consultants. A regional geologic map of the area is provided in Figure 3.2-1. Figure 3.2-2 provides an overview of general geologic features and rock types in the vicinity of the Operation Area Boundary based on 2007 data available from the USGS. Nomenclature and classification of the rocks in the analysis area has differed over the years by authors. “PC – quartzite” listed on the legend is described in closer detail by others as metasedimentary rock which includes several rock types including quartzite, schist, calcareous schist, and marble. In addition, extent of outlines (contacts) of rock types may differ slightly among references.
Bedrock geology in the region can be subdivided into three generalized groups based on age, lithology, and stratigraphic relationships (listed from oldest to youngest):

- **Pre-Cretaceous to Ordovician**, (greater than 440 million years ago [Ma]), metasedimentary rocks within the Idaho Batholith. These units are exposed in the West End pit and southeast portion of the Yellow Pine pit areas and include a succession of folded, faulted, and metamorphosed carbonate and siliciclastic rocks that comprise a portion of the original rock that was later intruded by the Idaho Batholith and remains as a roof pendant, or mass of original rock that remains after being intruded by igneous rock and projects downward into intrusive rock. Figure 3.2-3 presents a typical stratigraphic column of these materials.

- **Cretaceous** (145 to 66 Ma) igneous rocks of the Idaho Batholith. These rocks host the Hangar Flats deposit and parts of the Yellow Pine deposit and underlie much of the rest of the area. The igneous rocks consist primarily of granodiorite and granite with lesser amounts of diorite and aplite. Nomenclature and classification of the rocks that comprise the Idaho Batholith has differed over the years by authors. In this EIS, the term granodiorite is used synonymously with quartz monzonite to describe the primary rock types of the Idaho Batholith. Intrusive rock nomenclature correlations are described in Gillerman et al. 2019 (Table 2-2).

- **Tertiary** (65 to 1.6 Ma) intrusive and volcanic rocks.

**Surficial Deposits and Features**

In the analysis area, repeated erosional and depositional processes occurred that were associated with glaciation during the Pleistocene. Colman and Pierce (1986) estimated the last glacial advance in the area was approximately 20,000 years ago. Glaciers created U-shaped valleys with over-steepened, talus-covered sides, and hanging-valley tributaries. U-shaped valleys also contain lateral, terminal, and recessional hills and ridges of glacial earth debris, called moraines, as well as glacial outwash deposits at their lower ends.

Alluvial fans are the result of erosion and deposition of material by a stream or river into an adjacent basin. These deposits tend to be fan-shaped in plan view, radiating away from a point source higher up the drainage or valley. Several small alluvial fans in the analysis area have formed over the older glacially derived landforms.

A large alluvial fan occurs below the EFMC (known as the Blowout Creek fan). The failure of a water reservoir earthen dam in 1965 helped create this fan by depositing large amounts of sand and gravel (Midas Gold 2016a, Figure 1). Several coalescing fans also occur at the toe of Garnet Creek (east of the proposed ore processing plant area) and the two smaller drainages to the north. Many of these fans can be and often have been the areas of avalanche runout.

Glacial outwash is glacially derived material that is eroded, reworked by water sourced from glaciers upgradient, and then deposited downstream. Glacial outwash occurs throughout the analysis area and underlies nearly all the larger valley areas.
Figure 3.2-1
Valley County
Regional Geologic Map
Stibnite Gold Project
Stibnite, ID

Figure Source: Digital Atlas of Idaho 2017, modified by Perpetua
Figure 3.2-2
Generalized Geologic Map of Analysis Area
Stibnite Gold Project
Stibnite, ID

LEGEND
Analysis Area Components
Mine Site
- Open Pit
- Tailing Storage Facility
- Tailing Storage Facility Buttress
- Borrow
- GM Stockpile
- Incidental
- Laydown
- Plant and Infrastructure
- Stockpile
- Workers Housing
- Burntlog Route
- Groomed OSV Route
- OHV Trail
- Cell Tower Access Road
- Burntlog Route Borrow Source
Utilities
- Upgraded Transmission Line
- New Transmission Line
- New Substation
- Existing Substation
- New Communication Tower
- Existing Communication Tower
- New Cell Tower
Offsite Facilities
- Burntlog Maintenance Facility
Other Features
- U.S. Forest Service
- County
- City/Town
- Monumental Summit
- Highway
- Road
- Stream/River
- Lake/Reservoir

Fault
Geohazard Areas
- High Erosion Potential
- Landslides and Sloughs
- Rock Fall Areas
- Wet Areas/Seeps
Rock Type
- Qp - Alluvium
- Tei - Granite
- Km - Granitoid
- Ki - Granodiorite
- Qs - Loess
- Yls - Meta-argillite
- PC - Quartzite
- Tev - Rhyolite
- Qpc - Tilt
- OW - Water

Base Layer: USGS National Map 3D Elevation EROS
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 2.5 miles when printed at 11x17
Figure 3.2-3
Typical Bedrock Stratigraphy of Stibnite
Stibnite Gold Project
Stibnite, ID

Figure Source: Smitherman 1985 as modified by Perpetua 2017
Modern (Holocene, about 12,000 years ago to present) stream drainage patterns indicate high rates of erosion in the analysis area with coarse-grained sedimentary fluvial deposits in floodplains comprised of a mixture of angular clasts from adjacent bedrock sources combined with more rounded reworked glacial deposits.

**Structural Geology**

The major structural geologic features in the analysis area include Mesozoic folds and Cenozoic faults. Primary references that describe regional geology include Gillerman et al. (2019) and Stewart et al. (2013, 2016).

Folds are a result of pressure on rock causing the rock to bend or fold rather than break. There are multiple fold features in the vicinity of the analysis area including the Tamarack Antiform about 3 miles north of the Yellow Pine pit area (Stewart et al. 2016). Two large map-scale folds with numerous smaller fold structures are known in the Stibnite roof pendant and were first identified as early as the 1920s (Currier 1935; Larsen and Livingston 1920).

The largest fold in the analysis area is the Garnet Creek Syncline, a 3.5-mile-long, northwest-trending syncline (Smitherman 1985; Stewart et al. 2016). A second large fold structure occurs northeast of the Garnet Creek Syncline. It has been informally named the Cinnabar Peak Antiform by Perpetua. The folds in the analysis area are cut by several major fault zones. The most pronounced offsets occur along the Fern Fault in the southeast end of the Stibnite roof pendant and along the Meadow Creek Fault in the northwest end of the roof pendant (Stewart et al. 2016).

A fault is a discontinuity in a volume of rock across which there has been significant displacement as a result of rock-mass movement. Large, north-south striking faults, steeply dipping to vertical structures occur in the central and eastern portions of the analysis area including Meadow Creek Fault Zone (MCFZ); West End Fault Zone (WEFZ); Scout Valley Fault Zone; Garnet Creek Fault Zone; Rabbit Creek Fault Zone; Fern Fault Zone; and Mule Fault Zone. The MCFZ and WEFZ exhibit pronounced fault gouge (finely crushed and ground-up rock) and multiple stages of brecciation, suggesting multiple periods of movement. Available information indicates faults were active over 23 Ma (e.g., Gillerman et al. 2019). These fault zones are poorly exposed, exhibit recessive weathering (surrounding rock is more resistant to weathering than the fault gouge material), and some occur under or along the flanks of the glacially carved valleys.

Regional studies of area fault systems indicate there is a low likelihood of active faults in the analysis area (URS Corporation [URS] 2013) although ground shaking at the Operations Area Boundary caused by earthquakes is possible (URS 2013). The March 2020 Stanley, Idaho earthquake with a magnitude 6.5 and aftershocks occurred southeast of the mine site, about 45 miles west of Challis, Idaho, outside the analysis area. The closest earthquake epicenter to the site in the project-specific earthquake catalog is a magnitude 4.0 earthquake that occurred on August 3, 1963, located about 2.5 miles west-northwest of the SGP.

**Mineralization**

Mineralization in the analysis area began in the late Cretaceous. Hydrothermal alteration is associated with igneous intrusive rocks of the Idaho Batholith and surrounding metasedimentary rocks. Metals
mineralization typically occurs in association with very fine-grained disseminated pyrite and arsenopyrite, with gold almost exclusively in solid solution in these minerals (M3 2019). Antimony mineralization occurs primarily as the sulfide mineral stibnite. Zones of silver-rich mineralization locally occur with antimony and are related to the presence of pyrargyrite, hessite, and acanthite. Coarse-grained stibnite veins are commonly associated with a later stage of mineralization (Gillerman et al. 2019). Tungsten, as the mineral scheelite, occurs as veins and in breccias often intergrown with stibnite, although in many cases scheelite has been observed cemented by or crosscut by stibnite (Midas Gold 2017a).

The alteration that occurred as a result of batholithic intrusion in the Yellow Pine and Hangar Flats deposits is described by White (1940) and Lewis (1984). Gold-bearing mineralization originally occurred as part of multiple phases of hydrothermal replacement. A subsequent high temperature sulfide mineralization phase initially contained little gold but as temperatures decreased, gold-bearing mineralization increased (Midas Gold 2017a).

Regional mapping by the Idaho Geological Survey (Stewart et al. 2013) outlines a previously unrecognized, major, northeast-trending graben complex trending through and just to the southeast of the area (Figure 3.2-2). This feature is likely a fundamental structural control on at least some of the mineralization in the district.

3.2.4.2 Mineral Reserves

The 2021 Feasibility Study prepared for the SGP reports an estimated Proven and Probable Mineral Reserve (the economically mineable part of the measured mineral resource) of 115.3 million tons of ore containing 4.8 million ounces of gold, 6.4 million ounces of silver, and 149 million pounds of antimony (M3 2021). The mineral reserve estimate includes reprocessing approximately 3 million tons of historical mill tailings that underlie the spent leach material in the SODA, which would be mined and used for construction of the TSF.

Yellow Pine Deposit

Mineralization of the Yellow Pine deposit is structurally controlled and localized by the MCFZ and related structures. Gold and antimony have different geochemical signatures, geometries, and locally occurred in different structures during deposition. The deposit shows some apparent zonation with gold occurring throughout the deposit footprint, but with antimony and tungsten primarily in the central and southern portions of the deposit (M3 2019).

The dominant fault directions mapped underground and in the open pits by various geologists from BMC (1938 to 1952), White (1940 to 1941), Cooper (1950 to 1951), and Midas Gold (2012) trend north-south, northeast, and east-northeast. However, the controls for antimony mineralization show more northwesterly trends. The different geometries of antimony and gold distribution suggest different controls for mineralization: antimony is more strongly influenced by northwest fracturing and gold is more strongly influenced by northeast and east-northeast structures.
Historically, 6.48 million tons of ore were mined from the Yellow Pine deposit (Midas Gold 2016a). From the mined materials, 479,517 ounces of gold, 1,756,928 ounces of silver, 40,275 tons of antimony, and 13,579,157 pounds of tungsten were extracted.

**Hangar Flats Deposit**

Mineralization within the Hangar Flats deposit is entirely intrusive-hosted, and structurally controlled and localized by the MCFZ. Past production and currently defined mineralized zones occur along variably north-plunging tabular to pipe-like bodies. The mineralized zones range in thickness from 16 to over 330 feet and can be traced several hundreds of feet down dip. At Hangar Flats, the mineralized zones become thinner, less continuous, and lower grade away from the main MCFZ (M3 2019).

Historically, 303,853 tons of ore were mined from the Hangar Flats deposit, primarily through underground mining (Midas Gold 2016a). From the mined materials, 51,610 ounces of gold, 181,863 ounces of silver, 3,758 ounces of antimony, and 1,062 pounds of tungsten were extracted.

**West End Deposit**

In the West End deposit, gold mineralization occurs preferentially where the northwest-striking, northeast-dipping calc-silicate and schist units are cut by the WEFZ or subsidiary faults, but all rock types host mineralization. Drilling at this location intersected gold mineralization associated with the WEFZ well below the historical pit bottom as deep as 1,300 feet below the original ground surface where mineralization was exposed prior to mining. In addition to sulfide mineralization, open fractures along the WEFZ and subsidiary faults have allowed for oxide formation at depth from meteoric water infiltration (M3 2019).

Historically 8,156,942 tons of ore were previously mined from the West End deposit (Midas Gold 2016a). From the mined materials, 454,475 ounces of gold and 149,760 ounces of silver were extracted.

**Exploration Prospects**

In addition to these mineralized areas, numerous prospects have been discovered during exploration and development activities in the vicinity of the analysis area over the past nearly 100 years. Some of these prospects were developed into mines while others remain undeveloped.

Besides pit expansion possibilities around the main deposits, other exploration targets may one day warrant consideration for development if they can be proved viable after additional exploration, environmental, socioeconomic, metallurgical, engineering, and other appropriate studies. Future proposed mining projects would require analysis and review under NEPA and be required to comply with other federal and state regulations that apply to mining projects.

**3.2.4.3 Legacy Mine Features**

Over 90 years of mineral exploration and development has created numerous prospect pits, shafts, adits, tunnels and underground mine stopes in the analysis area. The locations of former underground and open-pit mine workings have been identified using historic maps and files from legacy operators and
researchers active during operations. The SGP Plan of Restoration and Operations, provides a summary of the history of the Stibnite Mining District and depicts locations (Midas 2016a, Figure 4-2) of previous mining and related activities in the vicinity of the mine site (Midas 2016a).

The analysis area contains piles of rock material from legacy mining and processing activities that includes old development rock piles such as the Bradley dumps, the Meadow Creek Mine dumps, materials excavated and piled near the outlet to the Bailey Tunnel and Clark Tunnel, and material piles near the Yellow Pine pit lake at Monday Tunnel and along the former open-pit benches in the Yellow Pine pit. Tailings were deposited from the 1920s through 1950s in the Meadow Creek drainage and overlain in some areas by spent leached ore (e.g., SODA) in the 1980s and 1990s. Other areas of fill include development rock storage piles at the former Homestake pit, below the current Perpetua exploration camp and shop areas, in West End Creek, and as backfill in the former West End and Garnet pits. There also is a loaded former heap leach pad built, operated, and closed by Hecla Mining in the 1990s, and a series of partially unloaded pads to the east.

3.2.4.4 Paleontological Resources

Potential Ordovician (approximately 485 to 444 Ma) invertebrate fossils were reported by Lewis and Lewis (1982), but later workers, examining the same sites and materials, have determined these are assemblages of alumino-silicate (tremolite) and calc-silicate minerals (Lund 2004; Stewart et al. 2016). The high metamorphic grade and extensive recrystallization of the minerals that make up the sedimentary rock units in the area generally precludes preservation of fossils that would be subject to the requirements of the Paleontological Resources Preservation Act.

3.2.4.5 Cave and Karst Resources

There are no known or suspected cave or karst resources in the analysis area. The extensive metamorphism of the carbonate rocks in the area, as well as level of exposure relative to the original ground surface where caves and karst would form, would generally preclude the existence or preservation of such features in the area.

3.2.4.6 Seismicity

Historic Seismicity

The analysis area is along the western boundary of the Centennial Tectonic Belt (CTB) also called the central Idaho Seismic Zone, which is centered in south central Idaho. Earthquakes with an approximate magnitude of 6 or greater have occurred in the CTB with epicenters east and southeast of the Operations Area Boundary (Figure 3.2-4). The analysis area is within the CTB and has the potential to be subjected to strong (magnitude 6 and greater) earthquake ground shaking from seismic activity related to the CTB feature (URS 2013).
Figure 3.2-4
Quaternary Faults of Central Idaho
Stibnite Gold Project
Stibnite, ID

Figure Source: Golder Associates, Inc.
Several moderate to large earthquakes have occurred in an approximate 60- to 90-mile radius of the analysis area including:

- 1916 Boise Earthquake (magnitude 6)
- 1944 and 1945 Seafoam earthquakes (magnitude 6.1 and magnitude 6.0, respectively)
- 1983 Borah Peak earthquake (magnitude 6.9)
- 1993 White Cloud Peaks earthquake swarm (highest single earthquake magnitude 5.1)
- 2020 Stanley earthquake (magnitude 6.5) (USGS 2020b)

These earthquakes occurred near the center of the CTB (approximately 30 miles southeast of the analysis area) (URS 2013, USGS 2020b, Golder 2021). The most significant potential seismic sources near the analysis area include the Cascade, Council, Deadwood-Reeves Creek, Long Valley, and Sawtooth fault zones (Golder 2021) (Figure 3.2-4).

Although numerous faults are present within the analysis area, none show evidence of recent active movement nor do historic records suggest this has occurred. However, shallow mass slope movements related to weathering and typical slope processes in mountainous terranes (e.g., slumps, debris slides, avalanches) do occur, and activation of these features during a strong seismic-induced ground shaking event is possible (URS 2013).

**Seismic Hazard Analysis**

A seismic hazard analysis describes the natural phenomena such as ground rupture, fault movement, or soil liquefaction that could be caused by an earthquake. The purpose of the analysis is to determine the magnitude of ground accelerations due to various earthquake events to be used in the stability analysis. The results of seismic hazard analysis are used as a basis for design and mitigation measure decisions (FEMA 2006). An initial site-specific seismic hazard analysis (SHA) was conducted by URS (2013). In conversations with the IDWR, Perpetua was advised to update the SHA for the SGP. The update was prepared by Golder Associates Inc. in May 2021 (Golder 2021).

The updated SHA incorporated technical developments in SHA methodology since 2013 and utilized updated seismic source (earthquake) records from the USGS national seismic hazard map in 2014, 2018, and data from the March 2020 earthquake near Stanley, Idaho. Golder revised the list of faults considered in the SHA by URS (2013) to delete one small fault and add four large faults. The nine major crustal faults within 62 miles of the SGP that were considered in the Golder analysis included: Deadwood-Reeves Creek, Long Valley, Sawtooth, Council, Shirt Creek, Rush Peak, Lost River-Challis Section, Lost River-Challis /Warm Springs/Thousand Springs Sections, and Squaw Creek. Of these, the Deadwood-Reeves Creek fault was the closest to the SGP site at a geometric distance of about 5.3 miles.

In addition to the updated seismic source information Golder incorporated the updated earthquake acceleration attenuation ground motion models (GMMs) applicable to this part of western North America.

The seismic hazard is assessed from instrument measurements as well as historical accounts and geologic observations. SHA is quantified by three parameters: level of severity, spatial measurement, and temporal measurement (Wang 2009). The seismic hazard was assessed for the SGP site including the proposed
Stibnite Gold Project Supplemental Draft Environmental Impact Statement

TSF location, but the results are also usable for the other proposed facilities at the SGP. Golder performed both probabilistic and deterministic seismic hazards analyses. The combined results, probabilistic SHA (PSHA) and deterministic SHA (DSHA), are an effective means for determining maximum design earthquake ground motions. Maximum design earthquake is an earthquake that would produce the maximum level of ground motion (shaking) for which a structure (e.g., TSF dam) is to be designed or evaluated (FEMA 2005).

PSHA is used to determine the likelihood (probability of occurrence) that a given level of ground shaking could be exceeded during a specified timeframe at a site from a combination of earthquake sources. The likelihood of exceedance is determined by the probability of occurrence of any earthquake with a range of magnitudes, typically within about 62 to 125 miles of the selected site. The analysis includes consideration of the attenuation of ground motion from the earthquake sources to the site. Empirical GMMs are used to model the ground motion attenuation rate for any given earthquake magnitude, source-to-site distance, and site ground conditions.

Peak ground acceleration (PGA) is traditionally used to quantify ground motion (shaking) at a site and is generally a function of the magnitude of the event and distance from the source, but other factors may be considered, such as rock type or type of faulting. The PGA is typically expressed in terms of a fraction of gravity (g), with probability of exceeding a certain level over a specific period of time.

The PSHA results for the URS analysis indicated the PGA for 475-year and 2,500-year return period earthquake events are 0.06g and 0.14g, respectively. The Golder analysis indicated comparable PGA estimates of 0.075g and 0.18g for the same return periods, respectively. For context, a PGA of 0.1g in bedrock is considered the approximate threshold at which damage occurs in buildings that are not specially constructed to withstand earthquakes (FEMA 2006).

DSHA is based on known regional seismic sources and, unlike the PSHA, does not consider the probability associated with a particular earthquake hazard. In a DSHA, the ground motions at the site are estimated for the maximum credible earthquake that could impact the site. For the URS (2013) analysis the maximum credible earthquake modeled was a magnitude 6.9 earthquake on the Deadwood-Reeves Creek fault (URS 2013). This event was estimated to result in median calculated PGA of 0.43g at the SGP site. The Golder analysis was based on a maximum credible earthquake of magnitude M7 on the Deadwood-Reeves Creek fault which resulted in an updated PGA of 0.32g at the SGP site (Golder 2021). Golder explained the main reason for the differences in estimated PGAs at the site was that URS used the NGA-West1 Project GMMs available at the time (2013) and Golder used the updated NGA-West2 Project GMMs (Golder 2021).

Final design of the SGP TSF and other facilities would incorporate the site-specific ground accelerations calculated from the latest seismic hazard analysis.

The Golder (2021) SHA results are similar to those of the USGS National Seismic Hazards Maps (NSHMs) which are the basis for the U.S. building code provisions and the International Building Code. The Golder results are less than, or about the same, as the 2014 USGS NSHM but larger than comparable hazard values in the USGS 2018 NSHM.
3.2.4.7 Foundation Characterization and Mass Wasting Hazards

Mass wasting or geohazard features in the Operations Area Boundary mine area and access roads can be classified in landslides or rockfalls and snow avalanches.

“Landslide” is a general term used to describe the downslope movement of soil, rock, and organic materials, or a combination thereof, under the effect of gravity. The term landslide also describes the landform that results from such movement (Highland and Bobrowsky 2008). Landslide types include rockfalls, deep-seated slope failures, mudflows, debris flows, and slumps. Debris flow is a mass of soil and/or fragmented rock in slurry of water that moves downslope under the influence of gravity and forms muddy deposits in valley floors. Slump as defined for the EIS: Geohazard assessment reports (STRATA 2013, 2014a, 2016) use the term “slough” and “slump” interchangeably to refer to “small landslides” of less than 0.1 acre. For purposes of consistency, this EIS uses the term “slump” in the text. However, figures originating from the referenced geohazard assessment report may still retain the use of “slough.”

Many of the very large landslides in the area are likely post-glacial features. During glaciation large chunks of ice may become buried in glacial till. When the ice melts after glaciation, the materials can become unstable, resulting in large landslides. Some of the larger geohazards features depicted on Figure 3.2-5 may have occurred through this process. An example is the landslide identified on the east side of the East Fork SFSR north of the camp area (STRATA 2014a).

An "avalanche" is a slope failure composed of a mass of rapidly moving, fluidized snow and ice that slides down a mountainside. After initiation, avalanches usually accelerate rapidly and grow in mass and volume as they entrain more snow and ice. Avalanches can pick up debris from the ground, including soil, rock, large boulders, and trees.

Avalanches occur on slopes averaging 25 to 50 degrees, with the majority on slopes between 30 and 40 degrees, and several avalanche hazard areas occur within the analysis area (Figure 3.2-5). Avalanches are triggered by natural seismic or climatic factors such as earthquakes, thermal changes, rainfall, and blizzards, or by human activities (Idaho Office of Emergency Management 2018).

The most common types of avalanches are loose-snow and slab avalanches. A loose-snow avalanche is composed of dry, fresh snow deposits that accumulate as an unstable mass atop a stable snow and slick ice sublayer. A loose-snow avalanche releases when the sheer force of its mass overcomes the underlying resistant forces of the cohesive layer. A slab avalanche generally is composed of a thick, cohesive snowpack deposited or accumulated on top of a light, cohesion-less snow layer or slick ice sub-layer. At the starting surface or top of the slab, a deep fracture develops in the slab of well-bonded, cohesive snow. A slab avalanche release is usually triggered by turbulence or impulse waves.

Operations Area Boundary

The following subsections describe the geology and known landslide and avalanche hazards in the vicinity of the Operations Area Boundary based on geologic hazard assessments (STRATA 2014a, 2016) and an Avalanche Hazard Assessment for portions of the Operations Area Boundary (Mears and Wilbur...
Engineering 2013). **Figure 3.2-5** shows landslide and rockfall (slope failure comprised of rock) features in the vicinity of the SGP, as well as avalanche paths within the central Operational Area Boundary area.

Geologic and geotechnical conditions have been well characterized at the Operations Area Boundary by information derived from several studies conducted over multiple field seasons. Studies included drilling, sampling, and logging boreholes, standard penetration tests, cone penetrometer tests, geotechnical laboratory tests (e.g., particle size distribution, Atterberg limits, direct shear), groundwater monitoring wells, piezometers, aquifer slug tests, as well as specific structural geology investigation and a pit slope design study. A comprehensive discussion of available geologic information is provided in the SGP Geotechnical Investigations Summary Report (Tierra Group 2018), the Geotechnical Baseline Summary (STRATA 2017; Tierra Group 2017), and the SGP Feasibility Study Technical Report (M3 2021).

Structural orientations of faults and joints were measured at rock exposures as well as the width, infill, and kinematic indicators, if present. In addition to examination of surface exposures, oriented boreholes were drilled in the Yellow Pine pit, West End pit, and Hangar Flats pit areas and continuous rock core was sampled (Tierra Group 2018).

Several studies were performed to evaluate pit slope design (STRATA 2014b). The STRATA (2014b) study found that the rock at all three pits consisted predominately of quartz monzonite and quartzite. These rock types are typically very competent.

The SGP Comprehensive Baseline Geochemical Characterization Report (SRK 2021a) provided combined results of Phase 1 and Phase 2 rock geochemical characterization programs and the overall conclusions of the updated characterization were not changed from the 2017 reporting.

The SGP Geotechnical and Geophysical Data Evaluation Memo (Brown and Caldwell 2022a) describes statistical analyses of core structural characteristics and also shallow seismic surveys completed in 2017. This information described a widespread bedrock condition in the SGP area where the upper portion of the bedrock directly underlying unconsolidated materials was more weathered and fractured than the underlying, more competent bedrock.

**Northern Area: Yellow Pine and West End Pits**

The terrain in the northern Operations Area Boundary is relatively steep with natural timbered slopes as steep as approximately 31 degrees (1.67H:1V). Waste rock disposal areas from previous mining activity are northeast of the historic Homestake pit (the site of northeastern end of proposed Yellow Pine pit) and to the southeast of the historic West End pit.

Observed overburden thickness in the area northwest of the planned Yellow Pine pit ranges from 47 to at least 180 feet, and depth to bedrock generally increases toward the west. The uppermost material in boreholes drilled approximately 2,000 feet to 750 feet northwest of the outline of the Yellow Pine pit consists of development rock from legacy mining activities (STRATA 2017; Tierra Group 2017). Native soil beneath the development rock is mostly sand, with some gravel. Overburden depth in the valley bottom area south of the Yellow Pine pit ranges from 47 to 61 feet and consists mostly of sand and gravel, with occasional layers of silt noted in the borehole logs. Side slopes to the west have thicker overburden, up to 200 feet thick, composted of glacial outwash materials.
**Figure 3.2-5**

Geohazard Locations Within the Analysis Area

Stibnite Mining District
Stibnite Gold Project
Stibnite, ID

Base Layer: Hillshade derived from LiDAR supplied by Perpetua
Other Data Sources: Perpetua; Boise National Forest; Payette National Forest

**LEGEND**

**Geohazard Sites**
- High Erosion Potential
- Landslides and Sloughs
- Rockfall Areas
- Wet Areas/Seeps

**Geohazard Area**
- High Erosion Potential
- Landslide and Sloughs
- Rockfall
- Sensitive Soil
- Wet Areas/Seep

Avalanche Hazard Areas
Project Features
Patented Claim Boundary
Lake/Reservoir
Stream/River

**Project Features**
- Patented Claim Boundary
- Lake/Reservoir
- Stream/River

**Other Data Sources**
- Perpetua; Boise National Forest; Payette National Forest
The predominant structural feature in the Yellow Pine pit area is the MCFZ, which generally is north-northeast striking and steeply dipping to the west or northwest. Associated with the zone are north-striking, west-dipping conjugate splay or cross structures. The widest recognized section of the fault zone is about 190 feet wide. Other faults in the area tend to be sub-parallel to the MCFZ; these include the Hennessy Fault, Hanging Wall Shear Fault, C-Shear Fault, Meadow Creek Hanging Wall Fault, and Meadow Creek Footwall Fault.

Eleven boreholes, ranging in length from 56 to 695 feet, were drilled along the East Fork SFSR tunnel alignment during multiple investigations, and additional overburden and bedrock boreholes were drilled nearby for Yellow Pine pit exploration and geotechnical investigations to aid interpretation of subsurface conditions. Overburden near the proposed tunnel portals consists of legacy development rock and native glacial till ranging in grain size from silt through boulders. Depth to bedrock was 55 to 136 feet. Bedrock along the tunnel alignment is generally unaltered to weakly altered and weakly mineralized. Hennessy Shear Zone and MCFZ displayed fractured intrusive rock, with zones of gouge and breccia. Four seismic refraction geophysics lines were completed at the portals to define the bedrock profile.

A full description of these geotechnical investigations, stratigraphy, rock mass characterization, and geophysics is provided in the Geotechnical Investigations Summary Report (Tierra Group 2018) and East Fork SFSR Tunnel Design Documentation Report (McMillen Jacobs 2018).

The Yellow Pine backfill is wholly within the Yellow Pine pit and would be underlain by bedrock. Yellow Pine backfill would be placed within the Yellow Pine pit long after overburden is removed from the area. Fifteen boreholes were completed in this area during multiple investigations, including five boreholes to classify the rock mass (no overburden geotechnical data was collected for these five boreholes).

The predominant structural feature in the West End pit area is the WEFZ, which generally is striking north-northeast and steeply dipping southeast, and includes the Hanging Wall, Middle, and Footwall faults.

Two slumps, four landslides, and a rockfall are noted in this area (Figure 3.2-5). The isolated slumps likely were caused by oversteepening of the slope due to road cuts and the presence of groundwater seepage near or at the ground surface. Potential rockfalls are primarily related to former open-pit mining slopes in the Homestake pit, West End pit, and the Stibnite pit.

The Avalanche Hazard Assessment (Mears and Wilbur Engineering 2013) did not include an assessment of avalanche hazards in the vicinity of the proposed Yellow Pine and West End pits.

Central Area: Mine Support Facilities

The central area extends south of the Yellow Pine pit and encompasses most of the proposed mining support facilities in or adjacent to the East Fork SFSR valley floor, a relatively flat area. Geologic materials are comprised of alluvium, glacial deposits, and ancient landslide deposits (STRATA 2013).

Twenty-four geotechnical boreholes and groundwater monitoring wells were completed at the area of the ore processing facility and proposed Scout exploration decline during multiple investigations. Native soils
consist of alluvial and colluvial sands and gravel. Bedrock was encountered at depths ranging from 5 to 97 feet below ground surface.

Potential geohazards identified in the Central Area are shown on Figure 3.2-5 and include two slumps, one landslide, three rockfalls, and three areas with groundwater seeps.

Two relatively small slumps occur in old road cuts along a now obscured former access road. The other slump is just north of the first slump. Groundwater seeps suggest that seeps and elevated groundwater may have helped initiate these slope failures (STRATA 2014a).

A larger landslide covers several acres to the east of the East Fork SFSR and is believed to be a post-glacial landslide. A groundwater seep also occurs near the south margin of the landslide.

Directly behind and to the east of the core building at the exploration camp is a rock outcrop producing a rockfall comprised of angular cobbles and small boulders. The hill slope to the west of the confluence of Meadow Creek and the East Fork SFSR has large steep outcrops of quartz monzonite that could produce rockfalls (STRATA 2014a).

Mapped avalanche paths in this area are mostly on the slopes to the east of Meadow Creek. Some are mapped between the proposed cell tower access road and new transmission line segment (Figure 3.2-5) (Mears and Wilbur Engineering 2013).

Southwest Area: Hangar Flats Pit and SODA

The southwest area is within the relatively flat valley floor of Meadow Creek. The area is the proposed location for the Hangar Flats pit. The SODA is currently upstream from the former Hecla heap leach pad in this same terrain.

Exploration drilling in the Hangar Flats area indicates that depth to bedrock increases greatly with distance from adjacent valley slopes, suggesting a deep U-shaped valley, filled with stream sediments overlying glacial deposits. Overburden thickness is greatest in the south-central area, where the depth to bedrock was noted to be more than 250 feet (borehole SRK-GM-22S). Surficial soils were moderately dense to dense sands with some gravel and occasional silt layers. Beneath the surficial layers, the soils are mostly sand and gravel inter-bedded with silty sand. At depths greater than 200 feet, clayey sand and clayey gravel were encountered.

The predominant structural feature in the Hangar Flats area is the MCFZ, which generally is north-striking and steeply dipping (nearly vertical). Associated with the zone are northeast or east-trending, nearly vertical conjugate structures. Splays of the MCFZ are common and trend northeast, with shallow dips to the northwest. The MCFZ is a broad structural zone, marked by intense shearing, characterized by fault breccia and gouge.

Based on reconnaissance and helicopter fly-over observations, five landslides were identified in this area by STRATA (2014a) (Figure 3.2-5). A narrow (about 200 feet wide) debris flow scar originates near the Meadow Creek Mine portal and extends downslope to the valley floor. Another narrow landslide area is in a shallow drainage on the north hillside near the west end of the SODA.
A slow-moving landslide (i.e., creep) of approximately 20 acres is in the mouth of the drainage above the west end of the Hecla heap leach site. The toe of the landslide is near the projected toe of the TSF Buttress.

Two landslide features occur on the northwest-facing hill slope to the south of the Meadow Creek confluence with East Fork SFSR and extending to the mouth of Blowout Creek. One is characterized by irregular hummocky ground and seeps indicate past landslide activity covering approximately 80 acres. A smaller slump in a road cut is present about half-way downslope and to the west. This slump area appears to be several years old and has been treated with staked erosion control matting; new vegetation is established in the scar.

The majority of the SODA and the proposed TSF Buttress are within mapped avalanche hazard zones (Figure 3.2-5) (Mears and Wilbur Engineering 2013).

Southeast Area: East Fork SFSR and Worker Housing Facility

The terrain in southeast area is primarily in or adjacent to the valley floor of the upper reaches of the East Fork SFSR and is relatively flat.

Seven boreholes were completed at the Worker Housing Facility area during multiple investigations. Native soils consist of alluvial and colluvial sands and gravel. Bedrock was encountered at depths ranging from 23 to 39 feet below ground surface, but four boreholes were not advanced to bedrock.

Landscape features are dominated by glacial deposits, particularly lateral moraines and a large ancient landslide on the south hillside of the drainage, approximately 1 mile upstream of the confluence of the East Fork SFSR and Meadow Creek (STRATA 2014a). Two landslides were identified in this area in addition to two areas that were observed with seeps, indicating a potential for future slides.

A large, ancient (glacial age) landslide covers at least 200 acres south of the East Fork SFSR and appears to have dammed the drainage in the past, likely forming the depositional area that is now a flat meadow. This area is characterized by hummocky ground and local areas of seeps, or wet areas with spongy ground.

There also is an ancient landslide of about 9 acres upslope of the proposed worker housing facility in the East Fork SFSR valley about 1.3 miles upstream from its confluence with Meadow Creek. Thunder Mountain Road (FR 50375) crosses the central portion of this feature just east of the flat floodplain area.

Avalanche hazard zones have been identified in Rabbit Creek valley and the adjacent unnamed stream valley to the southeast, as well as directly east of the proposed worker housing facility. Additional avalanche hazards zones are mapped near the northernmost Burntlog Route borrow source (Mears and Wilbur Engineering 2013).
TSF Buttress

Eighty-six boreholes were drilled at the proposed TSF Buttress area during multiple investigations, with 42 of these boreholes specific to the SODA. Native soils generally consist of alluvial and colluvial sands and gravel. Bedrock was encountered at depths ranging from 90 to 180 feet below ground surface. Up to 75 feet of spent ore, and 55 feet of Bradley tailings were encountered.

Three borings were drilled at the proposed TSF Buttress and Hangar Flats pit footprint area to characterize the rock mass (Tierra Group 2018). The Hangar Flats pit geotechnical information is applicable to this area.

A full description of these geotechnical investigations, stratigraphy, and laboratory testing is provided in the Geotechnical Investigations Summary Report (Tierra Group 2018).

Effects of Legacy Underground Mine Openings

The first phase of large scale (mostly underground) mine development of the SGP area commenced in the 1920s and continued into the 1950s. This ore was processed in local mill and smelter facilities. The second period of major mining activity in the area commenced with open pit mining and heap leaching from 1982 to 1997. The open pits, development rock disposal areas, mill tailings, and spent heap leach materials resulting from these legacy mine operations are evident on the ground surface of the SGP property. The underground mine developments are not as obviously present and are discussed below. The descriptions of these mine operations were obtained from Victoria Mitchell's History of the Stibnite Mining Area (Mitchell 2000), and the 2021 Feasibility Study Technical Report (M3 2021).

The Hangar Flats deposit was mined underground between the 1920s and 1937 in what was known as the Meadow Creek Mine. The mine was developed on six levels with numerous drifts and crosscuts (tunnels), raises and winzes (underground shafts), and stopes (irregular openings where ore was removed). The mine openings were reinforced with wood supports and the exhausted stopes were backfilled with development rock. In addition to two Meadow Creek Mine adits, two other tunnels were driven toward the deposit from the north, including the North Tunnel in the Fiddle Creek Gulch and the Monday Tunnel along the lower East Fork SFSR. About 25,426 feet of underground workings were developed in the Meadow Creek Mine during this period. A small amount of additional ore was removed from the mine in the early 1940s from two levels of the mine that were not caved or flooded. Between 1951 and 1954, the Defense Minerals Exploration Administration (DMEA) carried out an underground exploration program immediately north of the Meadow Creek Mine that resulted in about 4,900 feet of underground workings on three levels.

The Yellow Pine Deposit claims were first staked in 1923 and explored with two short tunnels. The property was optioned to F.W. Bradley's Yellow Pine Mining Company in 1929 which did exploration of the Yellow Pine deposit in five tunnels and drove the Monday and Cinnabar tunnels on opposing sides of the valley. The Cinnabar Tunnel headed toward the east to explore and develop the Cinnabar Claim Group and the Monday Tunnel was driven over 6,000 feet south along the Meadow Creek Fault Zone to intercept the Meadow Creek Mine at its 400-foot level but stopped short of this goal. After the Meadow Creek Mine shut down, mining activities shifted in earnest to the Yellow Pine area with both open pit and
underground exploration and production between 1938 and 1952. Two shafts were sunk from the surface and three underground levels were developed with a winze (underground shaft) leading to the deepest level. Approximately 4,000 feet of underground workings (drifts, crosscuts, and stopes) were developed with the openings supported by timber sets. Exhausted stopes were backfilled with glacial till obtained from the surface overburden stripping. The decision was made in the early 1940s to increase production with open pit mining methods. In 1943 flow in the East Fork SFSR was routed around the Yellow Pine pit in the 3,500-foot-long Bailey Tunnel that collected the stream on the south side of the pit and discharged to Sugar Creek north of the pit. Between the late 1940s and 1952 all ore production from the Yellow Pine Mine was from the open pit operations which intercepted some of the former underground mine openings.

The legacy mine and heap leach disturbances from past surface mining activities in the Yellow Pine, Hecla, and West End open pits are not the subject of this discussion of the impacts of the underground mine openings on the 2021 MMP and will not be further discussed here.

The proposed Hangar Flats and Yellow Pine pits would intersect legacy underground workings and have been designed with this in mind. The locations of the above-described underground workings are shown on Figure 2.4-17 along with the proposed boundaries of the Hangar Flats and Yellow Pine pits.

In the 2021 MMP (Perpetua 2021a), the Hangar Flats pit has been reduced by 70 percent compared to the 2016 configuration (Midas Gold 2016a). One of the reasons contributing to this reduction, as noted in the 2021 Feasibility Study (M3 2021), is “a number of technical challenges, risks, and costs associated with mining through the extensive historical underground workings”. As shown on Figure 2.4-17, most of the Meadow Creek Mine underground workings underlie the proposed Hangar Flats pit. Perpetua’s mine engineer also notes that a double-wide catch bench (40-foot instead of 20-foot) is incorporated into the Hangar Flats pit design to partly account for some potential wall instability in the vicinity of underground workings (Perpetua 2021f).

The tunnels to the north of the main Meadow Creek Mine underlie the high mountain slopes to the west of the East Fork SFSR and would not underlie any of the proposed mine operations facilities. All of the Meadow Creek Mine underground workings and connected tunnels are not located under any of the proposed support facilities including the truck shops, mill complex, worker housing, TSF Buttress, or TSF embankment or impoundment.

The Yellow Pine pit would intersect portions of several tunnels, drifts, and stopes of the former Yellow Pine Mine underground workings, including portions of the Monday Tunnel and the Bailey Tunnel, and would completely mine through underground workings of the Yellow Pine Mine (Figure 2.4-17). Intersecting these features is not anticipated to result in stability concerns. The Monday Tunnel/Yellow Pine pit wall intersection would approximate the tunnel cross-sectional diameter as the pit wall would be nearly perpendicular to the tunnel axis. Similarly, much of the Bailey tunnel would be excavated by mining activity and the remaining pit/tunnel intersection would be nearly perpendicular to the final pit wall, leaving a remaining opening into the pit wall approximately 6 feet in diameter (Perpetua 2021f).

Expressions of legacy underground workings located below the ultimate pit backfill levels would be blocked/filled with development rock to prevent public or wildlife access prior to pit backfilling.
Expression of legacy underground working located above ultimate pit backfill levels would be closed in a manner similar to the East Fork SFSR and Scout Decline tunnels as described in Section 2.4.7.3.

**Access Roads**

To identify mass wasting hazards along the Burntlog Route and the Johnson Creek Route Alternative, the following information sources were used to evaluate risks:

- Avalanche hazard mapping was completed for the Operations Area Boundary and the final 2.5 miles of the Burntlog Route into Stibnite mine by Mears and Wilbur Engineering (2013).
- STRATA (2016) conducted a survey of geologic hazard conditions along the proposed Burntlog Route access road which mapped areas impacted by rockfalls, landslides, and wet soils.
- DAC (2018) reported on potential snow avalanche hazards affecting the Burntlog Route, including several alternatives that were under consideration at that time.
- The Warm Lake Summit area was included in the DAC (2018) mapping, as well as the Operations Area Boundary mapping completed by Mears and Wilbur Engineering (2013).
- DAC (2021) updated the avalanche mapping and risk analysis for the proposed and alternative access routes.

AECOM (2020c) conducted a study to identify probable landslides, rockfalls, and avalanche paths along the Burntlog and Johnson Creek routes based on 2020 aerial imagery and using the observed vegetation signatures, substrate color, erosion evidence, and slope calculations. Landslide and rockfall hazards were identified along existing road cuts based on vegetation signatures and evidence of migrating slope failures upslope of the road prism. Rockfall hazards were identified along existing road cuts based on vegetation signatures, substrate color, and evidence of slope erosion upslope of the existing road prism. Information from STRATA (2016) was considered along both existing and proposed roads. Snow avalanche paths were identified based on vegetation signatures and supplemented with slope calculations and compared to other data from the prior reports described above.

Hamre (2021) reported on both the Burntlog Route and the existing Stibnite Road portion of the Johnson Creek Route up the East Fork SFSR from the village of Yellow Pine. That work included evaluation of methods of avalanche risk reduction with associated costs and presented avalanche path mapping for the larger avalanche paths that affect Stibnite Road.

The avalanche mapping presented by DAC (2021) included detailed avalanche path descriptions for the Stibnite Road, Johnson Creek Road, and the Cabin Creek to Trout Creek snowmobile route. The Mears and Wilbur Engineering (2013) mapping was not modified because it was completed at a higher level of detail and field investigation (i.e., hazard zoning [Blue and Red]) for facilities. Any new or modified avalanche paths mapped by Hamre (2021) were considered and (in most cases) included as part of the DAC mapping. The DAC (2021) avalanche descriptions were comprehensive and included consideration of terrain factors including: elevation, vertical fall height, slope incline, aspect (direction that the starting zone faces relative to solar exposure and prevailing wind directions), terrain shape (concavity or convexity downslope and across slope), surface roughness, and vegetation cover (e.g., forest cover and tree density). Potential snowfall and snowpack depth amounts varied by elevation and geographic...
location. These variables were evaluated to assess the potential magnitude and frequency of avalanches expected to affect the roads at each path. DAC also described the miles of road potentially affected by the avalanche paths, potential frequency of avalanches (low to high), range of frequency in years, likely size of the avalanche at the road (D2 to D4), and descriptive comments of the potential avalanches.

Very small (D1, < 10 tonnes of snow mass) sized avalanches that would not present a risk to vehicles on the roads were not mapped. Small (D2, 100 tonnes of snow) that could be operational hazards to traffic were described, as were paths of D3 (1,000 tonnes of snow) sized avalanches that could bury or destroy a car. Only a few D4 (10,000 tonnes) sized avalanche paths were identified, located above the Stibnite Road. These large avalanches could destroy large trucks and a substantial amount of forest.

The Transportation Management Plan (Perpetua 2021e) shows the locations and extent of geologic hazards and avalanches described in the above referenced study reports for both transportation routes. That same information is shown on Figure 3.2-6.

**Burntlog Route**

Landslide and rockfall hazards have been assessed along the Burntlog Route, including in-field observations (STRATA 2016). Visual evidence of slope instability was reported at several locations along the route. Potential rockfall areas are primarily tied to existing road cuts occurring in both glacial till/colluvium and granitic outcrops.

Avalanche paths were comprehensively described by DAC (2021) for the overall Burntlog Route. Along the existing road from Warm Lake to Landmark they identified 11 avalanche paths potentially affecting 1.6 miles (Figure 3.2-6). These were relatively high frequency avalanche paths (1 to 3 years) producing small (D2), loose avalanches with two larger (D3) avalanche paths that could affect the road about every 3 years.

Along the existing Burntlog Road from Landmark to the ridge above Black Lake, seven D2 sized avalanche paths were identified potentially affecting 0.5 miles of road with four of them having the potential to affect the road on average every 10 years.

From the end of the existing Burntlog Road to Stibnite, 20 avalanche paths were identified along the alignment of the proposed extension of the Burntlog Road potentially affecting 2.4 miles of road. Most of these were D2-sized paths with high frequencies (1 to 3 years). There were two potential D3 paths with moderate frequencies (3 to 10 years).

A total of 38 avalanche paths were identified by DAC (2021) along the Burntlog Route from Warm Lake to Stibnite potentially affecting 4.5 miles of road (Figure 3.2-6).

**Johnson Creek Route**

The Johnson Creek Route includes Johnson Creek Road (CR 10-413) and Stibnite Road (CR 50-412). Identified geologic hazards, including those based on the desktop study are depicted on Figure 3.2-6. There is documentation of avalanches and landslides along this route (Midas Gold 2019a). In March 2014, a series of avalanches blocked Stibnite Road (CR 50-412) in two locations and caused the river to
reroute onto the road. In April 2019, a series of avalanches and related landslides caused extensive
damage to Stibnite Road (CR 50-412), resulting in closure of the road for approximately two months. The
slides pushed snow, timber, and other debris into the East Fork SFSR and up onto Stibnite Road, and
sections of the road near Tamarack Creek were washed away.

Avalanche paths were comprehensively described by DAC (2021) for the overall Johnson Creek Route.
The portion of the route from Warm Lake to Landmark is common with the Burntlog Route and is
described above. The 11 avalanche hazards affecting 1.6 miles of road for that segment are included in
the totals for the Johnson Creek Route.

Avalanche terrain along Johnson Creek begins approximately 10.5 miles north of Landmark. From that
point north to Yellow Pine, 20 avalanche paths were identified potentially affecting 2.4 miles of the
Johnson Creek Road. Most of these paths were at relatively lower elevations and were small sized.
Consequently, all paths along Johnson Creek Road were assessed to potentially produce D2-sized
avalanches with frequencies of 10 to 30 years and some of the same paths could produce D3-sized
avalanches with 30- to 100-year frequencies.

In the 13.5 miles from Yellow Pine to the north end of the SGP mine site, a total of 63 avalanche paths
were identified potentially affecting 4 total miles of road, 2.6 miles of which were likely to produce D2-
or D3-sized avalanches with low to high frequency (1 to 30 years) and 1.4 miles of which were likely to
produce D2- to D4-sized avalanches with low to high frequency that could cause damage to Stibnite Road
as documented in 2014 and 2019.

Avalanche paths across the East Fork SFSR have the potential to deposit snow and forest debris into the
river and on the road. Avalanches in this area can also create dams which could then cause scouring of the
riverbanks and damage the road.

Near the confluence of the East Fork SFSR and Tamarack Creek, about 6 miles from Yellow Pine, is a 2-
mile length of the canyon containing a total of 27 avalanche paths affecting 1.4 miles of road that is
almost continuously exposed to D2 and D3 avalanche paths that could impact the road with a 1- to 3-year
return period. These include five paths with the potential for producing D4-sized avalanches with a
frequency of 30 to 100 years, presenting a large hazard to traffic, and could severely damage the road
itself. A large amount of standing dead timber remains in these paths that could be entrained in these
avalanches.

A total of 94 avalanche paths were identified by DAC (2021) along the Johnson Creek Route from Warm
Lake to the SGP potentially affecting 8 total miles of road (Figure 3.2-6).
Figure 3.2-6
Identified Geohazards Along Burntlog and Yellow Pine Access Routes Stibnite Gold Project Stibnite, ID
Proposed Cabin Creek to Trout Creek OSV Route

The OSV Route was assessed for avalanche hazards by DAC (2021) to aid with managing this route during the winter months with respect to avalanche hazards. It was assumed that snowmobilers would follow the proposed alignment, which mostly follows an existing forest service road. Deviating from this alignment closer to either side of the valley could expose snowmobilers to a higher avalanche hazard. Like Warm Lake Summit, the OSV Route receives higher precipitation than other parts of the project area, which is expected to result in higher avalanche frequency than drier areas to the northeast.

A total of 18 avalanche paths potentially affecting 1.6 miles of the road were identified by DAC (2021) along the proposed OSV route (Figure 3.2-6). The relatively high snowfall along this route suggests that most of these paths are expected to produce D2-sized avalanches on an annual basis with potential D3 avalanches with a 10- to 30-year return period.

Summary of Geohazards and Avalanches along the Proposed Access Road Alternatives

Table 3.2-1 provides total geohazards identified along the Burntlog and Johnson Creek access routes.

<table>
<thead>
<tr>
<th>Access Route</th>
<th>Total Number</th>
<th>Length of Road Affected (Miles)</th>
<th>Total Number</th>
<th>Length of Road Impacted (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burntlog Route</td>
<td>26</td>
<td>2.9</td>
<td>38</td>
<td>4.5</td>
</tr>
<tr>
<td>Johnson Creek Route</td>
<td>451</td>
<td>4.2</td>
<td>94</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Source: Google Earth 2020; Mears and Wilbur Engineering 2013; Midas Gold 2019b, Mears 1992; STRATA 2016; DAC 2021

1 Total does not include two slump features along Johnson Creek Road. The slumps are not currently impacting the road prism.

3.3 Air Quality

3.3.1 Introduction

This section describes the area of analysis for air quality, applicable government requirements, and the baseline, or affected environment of the SGP area. Additional details may be found in the Air Quality Specialist Report (Forest Service 2022a).

3.3.2 Air Quality Area of Analysis

An air quality analysis usually relies on defined geographic regions that represent the areas for which different types of modeling would be conducted. First, a “near field” was examined using appropriate models to quantify the effects of action alternative sources. The near-field modeling domain for the ambient air quality analysis, which extends 10 km from the SGP, is depicted in Figure 3.3-1. Other aspects of the near-field modeling such as nitrogen and sulfur deposition used a domain of 50 km from the SGP. Federal modeling rules (40 CFR 51, Appendix W) stipulate that near-field models may be applied for distances of 50 km or less from the emission sources. For the SGP, preliminary modeling
confirmed that the 10-km domain size was adequate to characterize near-field air quality impacts. Air quality effects would typically decrease at distances beyond the modeled 10 km range.

The refined model uses a “grid” of defined receptor points at which air pollutant concentrations are predicted by the model calculations. Receptor tiers were used starting at 25 m along the Operations Area Boundary and transitioning to 1 km spacing out to the 10-km extent of the modeled domain to follow accepted regulatory modeling practice. Tighter spaced receptors were used closer to the Operations Area Boundary to allow the model to map in more detail the predicted close-in concentrations that are generally the highest.

Second, a much larger “far-field” region was defined within an area up to 300 km-radius from the SGP that encompassed more-distant Class I areas, wilderness areas, Tribal reservations, and other areas requested by Tribes were considered in the analysis. For the SGP, this region is shown in Figure 3.3-2, with the Class I areas identified.

A key concept in air quality analysis is the definition of “ambient air” as a defined area in which air pollutant effects to air are to be compared to the national and state ambient air quality standards because that area is accessible to the general public (EPA 2019a). For purposes of the SGP, the area outside the area of Operations Boundary is defined as ambient air for modeling analyses is the Operations Area Boundary. This area is illustrated in Figure 3.3-1 and is understood to be the limit of the operations area that would be closed to unrestricted public access. In this area, public access would be prohibited, or restricted through such measures that are accepted as means to control public access (EPA 2019a) such as security checkpoints, physical barriers at points of potential access road and trail entry, and security surveillance patrols.

A May 12, 2021, memorandum developed for the Forest Service by Stantec Consulting Services Inc. (Stantec) outlines the rationale to exclude a portion of the proposed seasonal through-site controlled public access road through the mine operations from the public as approved by both the IDEQ and the accepted by the EPA from ambient air for dispersion modeling purposes (Stantec 2021). This stretch of road is from Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375). The EPA Region X has indicated that the access road could possibly be excluded from ambient air if sufficient enforceable measures are taken to comply with the 2019 revised policy (EPA 2019a). To comply with this measure, Perpetua has developed an access and transportation management plan that is included as Appendix D in the Air Quality Specialist Report (Forest Service 2022a). The Stantec memorandum provides details that IDEQ, who is responsible for issuing air permits in the state, have excluded the road because of access restriction measures put in place consistent with their rules and requirements in the permit. Lastly, DEQ issued a final Permit to Construct (PTC) on June 17, 2022, that requires an Access Management Plan to be developed outlining specific requirements relating to access control. Further information regarding IDEQ’s ambient air interpretation is available in the PTC, condition 2.7, and the Response to Comments document, Comment 16.
Figure 3.3-1  
SGP Operations Area Boundary and Class II Modeling Receptor Grid  
Stibnite Gold Project  
Stibnite, ID

Legend

Receptors
- 25-m-spaced receptors along the OAB
- 50-m-spaced receptors extending 250 m beyond the OAB
- 100-m-spaced receptors extending 1 km beyond the 50-m-spaced receptors
- 500-m-spaced receptors out to 5 km beyond the OAB
- 1-km-spaced receptors out to 10 km beyond the OAB

Project Components *
- Mine Site
  - Tailings Storage Facility
  - Growth Media Stockpile
  - Open Pit
- Ore Processing Facilities / Mine Support Infrastructure
- Development Rock Storage Facility
- Workers Housing Facility

Haul Road

Other Features
- U.S. Forest Service
- Wilderness

*Project Components are associated with all Alternatives
Figure 3.3-2
SGP Location and Class I & II Areas, Wilderness Areas, Tribal Reservations, and Areas Requested by Tribe for Analysis
Stibnite Gold Project Stibnite, ID

LEGEND

- Stibnite Gold Project
- 50-km Analysis Area (Near Field)
- 300-km Analysis Area (Far Field)

Class I Areas
- Fish and Wildlife Service
- National Park Service
- Forest Service

Other
- Class II Wilderness Area
- Native American Reservation
- Nez Perce Requested Analysis Area

Map Source: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.

Other Data Sources: Perpetua; Air Sciences Inc.; United States Census Bureau.
3.3.3 Relevant Laws, Regulations, Policies, and Plans

The Clean Air Act (CAA) of 1970 (42 USC 7401 et seq.), as amended in 1977 and 1990, regulates air emissions and protects air quality and air quality related values across the U.S. Provisions of the CAA that are relevant to the analysis of SGP air quality effects are listed below:

- National Ambient Air Quality Standards (NAAQS)
- Attainment and Non-Attainment Area Designations
- New Source Review Permitting
- New Source Performance Standards (NSPS)
- Mobile Source Regulations
- Visibility and Regional Haze
- GHG Reporting Rule

Certain areas also may be designated for special protection of air quality. All U.S. lands are categorized as either “Class I” or “Class II,” under the CAA, which determines the level of protection from air pollution impacts provided by regulations. Mandatory federal Class I areas include international parks, wilderness areas, and national memorial parks that exceed 5,000 acres, as well as national parks that exceed 6,000 acres, which were in existence prior to August 7, 1977. All other areas were initially classified as Class II. The CAA also gives states and Tribes the ability to request re-designation from Class II to Class I status.

Land and Resource Management Plan: Physical, social, and biological resources on NFS lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. National Forest Land and Resource Management Plans embody the provisions of the NFMA and guide natural resource management activities on NFS land.

In the SGP area, the Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for air quality and include various objectives, guidelines, and standards for this purpose.

National Ambient Air Quality Standards: The EPA, in Title 40 CFR 50, established NAAQS for six criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM) including PM less than 10 microns in diameter (PM₁₀) and PM less than 2.5 microns in diameter (PM₂.₅), and sulfur dioxide (SO₂). The NAAQS set two levels of standards for each criteria pollutant: primary standards are health-based atmospheric concentration levels, across specific averaging times, and are protective of public health; secondary standards are in comparable form, and are established to protect commercial and natural resources, and public welfare.

While the EPA sets the NAAQS, most states, including Idaho, are responsible for implementing, attaining and maintaining the standards and this process is done through the State Implementation Plans (SIPs). The IDEQ is the regulatory agency for air pollution control for the State of Idaho. The CAA allows states to adopt their own standards if they are at least as stringent as the NAAQS. The State of Idaho has adopted the NAAQS by reference in IDAPA 58.01.01(107) in lieu of setting its own standards. In addition, Idaho has adopted an ambient air quality standard for fluorides in IDAPA 58.01.01(577). Literature survey and published air pollutant emissions inventory for gold mining do not list fluoride as a
potential emissions concern, and therefore SGP fluoride emissions are considered to be negligible. Table 3.3-1 lists the primary and secondary NAAQS that would apply to the SGP.

Table 3.3-1 National Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant and Averaging Time</th>
<th>Primary NAAQS</th>
<th>Secondary NAAQS</th>
<th>Exceedance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO, 8-Hour</td>
<td>9 ppm</td>
<td>N/A</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td>CO, 1-Hour</td>
<td>35 ppm</td>
<td>N/A</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td>Lead, 3-month</td>
<td>0.15 μg/m³</td>
<td>0.15 μg/m³</td>
<td>Not to be exceeded by the rolling 3-month average</td>
</tr>
<tr>
<td>NO₂, Annual</td>
<td>53 ppb</td>
<td>53 ppb</td>
<td>Not to be exceeded by the average of the 1-hour concentration in a calendar year</td>
</tr>
<tr>
<td>NO₂, 1-Hour</td>
<td>100 ppb</td>
<td>N/A</td>
<td>98th percentile of 1-hour daily maximum concentration, averaged over 3 years</td>
</tr>
<tr>
<td>O₃</td>
<td>0.070 ppm</td>
<td>0.070 ppm</td>
<td>Annual 4th highest daily maximum 8-hour concentration, averaged over 3 years</td>
</tr>
<tr>
<td>PM₂.₅, Annual</td>
<td>12 μg/m³</td>
<td>15 μg/m³</td>
<td>Annual mean, averaged over 3 years</td>
</tr>
<tr>
<td>PM₂.₅, 24-Hour</td>
<td>35 μg/m³</td>
<td>35 μg/m³</td>
<td>98th percentile, averaged over 3 years</td>
</tr>
<tr>
<td>PM₁₀, 24-Hour</td>
<td>150 μg/m³</td>
<td>150 μg/m³</td>
<td>Not to be exceeded more than once per year on average over 3 years</td>
</tr>
<tr>
<td>SO₂, 3-Hour</td>
<td>NA</td>
<td>0.5 ppm</td>
<td>Not to be exceeded more than once per year</td>
</tr>
<tr>
<td>SO₂, 1-Hour</td>
<td>75 ppb</td>
<td>N/A</td>
<td>99th percentile of 1-hour daily maximum concentration, averaged over 3 years</td>
</tr>
</tbody>
</table>

Source: EPA 2018a

μg/m³ = micrograms per cubic meter  CO = Carbon monoxide  m³ = Cubic meters
N/A = Not applicable  NAAQS = National Ambient Air Quality Standards
PM = Particulate matter  NO₂ = Nitrogen dioxide  O₃ = Ozone
SO₂ = Sulfur dioxide  ppb = Parts per billion  ppm = Parts per million

The EPA determines and publishes air quality attainment status in the EPA Green Book (EPA 2021a) based on whether the air quality in the area consistently meets the NAAQS. Areas that persistently do not meet this standard are designated as nonattainment areas. The geographic areas considered in the air quality analysis area are in attainment of the NAAQS for all pollutants and averaging times (IDEQ 2019a).

Federal Air Permitting: The New Source Review process requires facilities to undergo an EPA pre-construction review if they propose building new facilities or modifying existing facilities that would result in a “significant increase” of criteria pollutants per 40 CFR § 52.2376. The New Source Review is further broken down into Major Source Permits for stationary sources that emit criteria pollutants at levels that exceed the defined thresholds for the source type and Minor Source Permits for sources that have emissions below those thresholds. In Idaho, New Source Review air permitting is administered as a State Implementation Plan-approved state program from EPA.

Prevention of Significant Deterioration (PSD) permitting applies to new major sources or major modifications at existing sources for specific pollutants in cases where location of the source is in an
attainment or maintenance area. For these sources, the PSD program requires an assessment of best available control technology and expanded analysis of air quality impacts in Class I areas in 40 CFR 52.21. Areas surrounding the SGP are in attainment with the NAAQS. Applicability of the PSD program to the SGP depends on the magnitude of annual emissions for criteria pollutants.

For new or modified major sources subject to the PSD program, ambient concentrations in Class I and Class II areas also are compared to criteria air pollutant concentration increments that specify the maximum increase of ambient air concentrations of pollutants, or the “consumption of increment”, over the legally established baseline for an area. The analysis of increment consumption in specified areas under the CAA, and the available increment levels are specific to a given location. The allowable increment levels are more stringent in Class I areas, compared to Class II areas. It is the responsibility of the individual states, through their permitting programs, to ensure that the increments are not exceeded due to the development of new or modified facilities. While an increment analysis is required for new or modified major sources, it is recognized that new or modified minor sources also may consume increment. Because the assessment of increment consumption is part of state new source review programs, such an analysis is normally not included in air quality reviews under federal NEPA. However, a simple comparison of modeled pollutant concentrations to the increments for Class I and Class II areas was conducted as part of the SGP air quality analysis. Disclosure of the SGP impacts in comparison to PSD increments helps to inform decision makes and the public regarding the significance of impacts to local air quality.

A Title V operating permit is required for major stationary sources under the Federal Operating Permits Program provided in CAA implementing regulations at 40 CFR 70. Whether a source meets the definition of “major,” depends on the type and amount of air pollutants the source could potentially emit on an annual basis.

A determination was made by the IDEQ that the SGP would not require a Title V permit. This was based on the complete air emissions inventory for stationary sources submitted by Perpetua as part of its application for an air quality permit. On February 18, 2022, Perpetua submitted a PTC application and emission inventory. On June 17, 2022, IDEQ issued a final PTC and Statement of Basis (SOB) stating that the SGP will not require a Title V permit.

Federal New Source Performance Standards: The NSPS are codified at 40 CFR 60 and are incorporated in Idaho air regulations by reference. These rules establish requirements for new, modified, or reconstructed emission units in specific source categories. NSPS requirements include emission limits, monitoring, reporting, and record keeping. Applicable NSPS for the SGP emission sources are:

- 40 CFR 60 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 60.
- 40 CFR 60 Subpart LL – Standards of performance for metallic mineral processing facilities. All facilities located in underground mines are exempted from the provisions of this subpart. All surface facilities at which construction or modification commenced after August 24, 1982, are subject to this subpart.
• 40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. This subpart applies to diesel-fueled reciprocating engines, which would include the compressor and generator engines included in the SGP sources.
• 40 CFR 60 Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants. This subpart applies to the proposed limestone processing plant under the 2021 MMP.

National Emission Standards for Hazardous Air Pollutants: The federal National Emission Standards for HAPs (NESHAP) rules are codified at 40 CFR 61 and 63 and are incorporated in Idaho air regulations by reference. As part of the NESHAPs program, federal maximum achievable control standards are enacted to reduce the emissions of HAPs from both major source and area source categories.

Consideration of NESHAP Subparts in 40 CFR 63 indicates that there are three regulations and general provisions applicable to the SGP’s air emission sources:

• 40 CFR 63 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 63.
• 40 CFR 63 Subpart EEEEEEE (7E) - NESHAPs for Gold Mine Ore Processing and Production Area Source Category. The rule was promulgated in February 2011, and this NESHAP applies generally to gold ore processing and production of gold-bearing products. This NESHAP is applicable to minor or “area sources” of HAP, and so would apply to the SGP emission sources. Specifically, this NESHAP applies to gold recovery and refining that use carbon processes, non-carbon processes, and mercury retorts. Therefore, the “carbon-in-pulp” process included in the SGP process sequence that adsorbs dissolved gold into the carbon particles is subject to this subpart. The regulation establishes mercury emissions limitations and work practice standards to control mercury emissions from gold production processes.
• 40 CFR 63 Subpart ZZZZZZ – NESHAPs for Stationary Reciprocating Internal Combustion Engines. This subpart applies to the proposed diesel combustion engines at the SGP.
• 40 CFR 63 Subpart CCCCCC – NESHAPs for Source Category: Gasoline Dispensing Facilities. This subpart applies to the proposed gasoline storage tanks at the SGP.

Wilderness Act: The Wilderness Act of 1964 requires that wilderness areas be administered to preserve their wilderness character. The Wilderness Act also created the National Wilderness Preservation System (NWPS) to identify and preserve designated wilderness areas (NWPS 2019a). Further, the Wilderness Act contains specific provisions for managing and protecting these pristine areas (NWPS 2019b). The Forest Service included additional wilderness areas in the air quality screening and modeling for the SGP to evaluate potential impacts on the areas’ natural quality of wilderness character.

Greenhouse Gas Reporting Rule: GHGs are natural or anthropogenic gases that trap heat in the atmosphere and contribute to the greenhouse effect. In October 2009, the EPA issued the Mandatory Reporting of Greenhouse Gas Rule (MRR) in 40 CFR 98, which required reporting of GHG data and other relevant information from large sources and suppliers in the U.S. The gases covered by 40 CFR 98 are CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), and other fluorinated gases. Implementation of the MRR includes the greenhouse gas reporting program applicable to facilities for which actual emissions of GHG are greater than 25,000 metric tons per year. Facilities subject to the MRR are required to submit annual reports to
the EPA (CFR 2016). The Climate Change Specialist Report (Forest Service 2022b) addresses climate change and applicability of the MRR in further detail, but SGP GHG emission estimates would require compliance with the MRR.

**Mobile Source Federal Regulations:** Mobile source air pollution control requirements for gasoline and diesel on-road engines are codified in 40 CFR 80, 40 CFR 85, and 40 CFR 86. These standards are designed to reduce emissions from passenger cars, light trucks, and large passenger vehicles (including sport utility vehicles, minivans, vans, and pickup trucks) and to reduce the sulfur content of diesel and gasoline fuels. Under these provisions, the EPA initially established Tier 1 and Tier 2 emissions standards for the purpose of minimizing emissions from these sources. For the on-road vehicles that would be owned and operated by Perpetua, the regulatory criteria indicate that EPA’s Tier 2 emission standards program would apply.

Provisions for non-road diesel engines are codified in 40 CFR 89, 40 CFR 90, and 40 CFR 1039. Starting in 1996, manufacturers of non-road engines became subject to the EPA’s increasingly stringent Tier 1 through Tier 4 emissions standards, depending on model year and engine size (CFR 2011). All new diesel engines have been required to meet Tier 4 standards since 2015.

EPA’s mobile source regulations in 40 CFR 80 Subpart I Motor Vehicle Diesel Fuel; Non-Road, Locomotive, and Marine Diesel Fuel; and U.S. Emissions Control Area Marine Fuel contain provisions restricting diesel fuel sulfur content for fuel used in mobile sources, in order to prevent damage to the emission control systems. These restrictions would apply to the fuels that would be used by the SGP, as they were phased in for highway diesel fuel starting in 2006 and for non-road diesel fuel in 2007.

**Idaho Minor Source Air Permitting:** The State of Idaho has enacted air quality regulations that are administered by the IDEQ. With respect to new source review permitting, IDEQ uses a PTC program (codified in IDAPA 58.01.01.200-228) that applies to new and modified sources. In this manner, the PTC program serves to protect ambient air quality from impacts due to major and more-numerous non-major stationary emission sources.

The IDEQ requires minor source permits for new facilities that are subject to federal NSPS and/or NESHAP regulations. A determination was made by the State of Idaho that the SGP satisfies the requirements of the PTC program, based on demonstration of the SGP’s potential emissions and controls. This was based on the complete air emissions inventory of stationary sources that was submitted by Perpetua as part of its application to the IDEQ for an air quality permit. IDEQ issued a final PTC (Permit Number P-2019.0047) and SOB for the SGP (Facility 085-00011).

**Idaho Visibility Protection Requirements and Regional Haze Rule:** Atmospheric visibility is defined as the ability of the human eye to distinguish an object from the surrounding background. In 1980, the EPA adopted regulations requiring states to update their State Implementation Plans for protection of visibility in Class I areas in 40 CFR 51 Subpart P (40 CFR 51.300 through 40 CFR 51.307). As a federal land manager of Class I areas, the Forest Service also has affirmative responsibilities to protect air quality and air quality-related values, such as visibility, in the Class I areas.
The federal Regional Haze Rule, adopted by the State of Idaho in IDAPA 58.01.01.665-668, requires states to develop long-term, regional haze, State Implementation Plans for reducing human-caused pollutant emissions that contribute to visibility degradation and to establish goals aimed at improving visibility in Class I areas. Sources of haze-causing pollutants include emissions from industrial sources, tailpipes, agricultural equipment, and practices; and from natural sources such as volcanic emissions, windblown dust, and smoke from wildfires.

According to IDEQ, regional haze in Idaho's natural parks and scenic areas is attributable to a variety of natural and human source of air pollution and is greatly impacted by the effects of climate, such as drought, increased wildfires, and reduced precipitation (IDEQ 2017a).

**Idaho Toxic Air Pollutant Program:** The State of Idaho’s Toxic Air Pollutant Program is a stand-alone risk-based program that regulates approximately 350 pollutants determined by their nature to be toxic to human or animal life or vegetation. The program prohibits emissions of these pollutants in amounts that would injure or unreasonably affect human or animal life or vegetation. Toxic Air Pollutant emissions from industrial sources are compared to screening levels and limited by Acceptable Ambient Concentration for Carcinogens (AACC) (i.e., having the potential to cause cancer) and Acceptable Ambient Concentration (AAC) for non-carcinogenic pollutants. An air impact modeling analysis is required for projects having Toxic Air Pollutant emissions that exceed screening emission levels provided in IDAPA 58.01.01.585 for non-carcinogens, and IDAPA 58.01.01.586 for carcinogens. The modeling analysis must show that the acceptable ambient concentrations for non-carcinogens are not exceeded on a 24-hour average basis, and on a longer-term average for carcinogens. Perpetua submitted an application to IDEQ for review including emissions subject to the Toxic Air Pollutant Program. IDEQ issued a final PTC and SOB for the SGP demonstrating compliance based on the air emissions inventory submitted in Perpetua's application for PTC.

IDAPA 58.01.210.14(a) requires control technologies for toxic pollutants as required to demonstrate compliance with appropriate AAC/AACC values. This is known as Toxic Reasonably Available Control Technology (T-RACT). During the development of the IDEQ permit, specific controls were evaluated and determined to be acceptable and compliant with the standards. As a result, IDEQ is requiring the use of “low-arsenic” quartzite (90 parts per million [ppm] arsenic or less) development rock to be applied for capping haul roads excluding those with the various pits and rock storage facilities. In addition, the drill rigs would include a dust control system with a minimum efficiency of 90 percent. IDEQ issued a final PTC and SOB for the SGP demonstrating compliance with the acceptable ambient concentrations, based on the air emissions inventory submitted in Perpetua's application for the PTC.

**3.3.4 Affected Environment**

The air quality in a given location is characterized by a number of properties that can be physically monitored and evaluated. The existing conditions that may be affected by the SGP include ambient air quality in comparison to the NAAQS, visibility as impacted by regional haze and visible plumes emitted from mine activities, and current rates of atmospheric deposition of mercury, nitrogen, and sulfur compounds. The description of the affected environment addresses these issues and several other parameters that pertain to regional air quality.
3.3.4.1 Criteria Air Pollutants

For SGP-specific baseline concentrations, Perpetua (then Midas Gold) collected 20 months (November 2013 to June 2015) of PM$_{10}$ and PM$_{2.5}$ air concentration data at the approved Stibnite monitoring station (IDEQ 2013). The Stibnite monitor is in the same airshed as the SGP; characterized as mountain valley terrain with little or no industry. Additionally, this SGP particulate monitor is located within the near-field analysis area and was deemed by IDEQ to be representative of background conditions in the locale. The IDEQ formally approved the Monitoring Protocol and Quality Assurance Project Plan in December 2013 (IDEQ 2013). Both the meteorological and air quality monitoring began in November 2013 (Trinity Consultants 2017). After reviewing the data and associated quality control procedures, IDEQ concluded that the calendar year 2014 data for PM$_{10}$ and PM$_{2.5}$ data collected at the Stibnite monitoring station satisfied the applicable regulatory requirements and approved the data as representative for analysis (IDEQ 2015).

For the ambient air NAAQS demonstration, IDEQ identified the source for gaseous pollutant background data as the NW AIRQUEST database for years 2014-2017 (Washington State University 2018) to be used in conjunction with particulate matter data collected at the Stibnite monitoring station. Table 3.3-2 displays these data along with the applicable NAAQS. The areas considered in the analysis of air quality impacts are in attainment of the NAAQS for all pollutants and averaging times (IDEQ 2019a).

**Table 3.3-2 Ambient Air Data – Perpetua and NW Airquest Consortium Background Values**

<table>
<thead>
<tr>
<th>Pollutant and Averaging Time</th>
<th>Monitored Value and Units</th>
<th>NAAQS</th>
<th>Source and Period</th>
</tr>
</thead>
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<tr>
<td>PM$_{10}$, 24-Hour</td>
<td>37 μg/m$^3$</td>
<td>150 μg/m$^3$</td>
<td>Onsite monitor 1/1/14-12/31/14</td>
</tr>
<tr>
<td>PM$_{2.5}$, Annual</td>
<td>3.5 μg/m$^3$</td>
<td>12 μg/m$^3$</td>
<td>Onsite monitor 1/1/14-12/31/14</td>
</tr>
<tr>
<td>PM$_{2.5}$, 24-Hour</td>
<td>15 μg/m$^3$</td>
<td>35 μg/m$^3$</td>
<td>Onsite monitor 1/1/14-12/31/14</td>
</tr>
<tr>
<td>SO$_{2}$, 3-Hour (Secondary)</td>
<td>6.4 ppb</td>
<td>500 ppb</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
<tr>
<td>SO$_{2}$, 1-Hour</td>
<td>4.7 ppb</td>
<td>75 ppb</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
<tr>
<td>CO, 8-Hour</td>
<td>0.97 ppm</td>
<td>9 ppm</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
<tr>
<td>CO, 1-Hour</td>
<td>1.52 ppm</td>
<td>35 ppm</td>
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</tr>
<tr>
<td>NO$_{2}$, Annual</td>
<td>0.5 ppb</td>
<td>53 ppb</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
<tr>
<td>NO$_{2}$, 1-Hour</td>
<td>2.3 ppb</td>
<td>100 ppb</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
<tr>
<td>Ozone (O$_3$), 8-Hour</td>
<td>60 ppb</td>
<td>70 ppb</td>
<td>NW Airquest Consortium 7/1/14-6/30/17</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2018a, 2018b; EPA 2018d; WSU 2018

1 Maximum 2nd-high value for the data collection period.
2 Annual mean value for the data collection period.
3 98th-percentile for the data collection period.
4 Average of the 99th-percentile daily maximum 1-hour values for the data collection period.
5 Average of the 99th-percentile daily maximum 1-hour values for the data collection period.
6 Weighted average of quarterly means for the data collection period.
3.3.4.2 Hazardous Air Pollutants

There are no permitted sources of HAP emissions in the vicinity of the SGP area. One source, the Tamarack Mill, LLC. is 75 km away, and reported minor source level emissions of 5.9 tons per year of HAPs in 2014 (Trinity Consultants 2017). Due to absence of permitted HAP emission sources in the air quality analysis area, it can be assumed that baseline ambient concentrations of HAPs are low and less than more industrialized or populated areas.

3.3.4.3 Ozone

For purposes of identifying a baseline value for NAAQS assessment of O₃ impacts due to SGP sources, the IDEQ selected the baseline value from the NW AIRQUEST database for years 2014 through 2017 (Washington State University 2018).

The National Park Service (NPS) has been operating a continuous O₃ monitor at Craters of the Moon National Monument (CRMO) from 1992 to present. This monitor is the only O₃ data source in the region that is not located in an urban area, therefore, it is likely representative of conditions near the SGP and surrounding rural area. The highest one-hour maximum O₃ concentration recorded at the monitor was 91 parts per billion (ppb) recorded in July 1996 and again in August 2008. However, there is no one-hour NAAQS for O₃. The highest O₃ concentration measured at CRMO that is comparable to the 8-hour average NAAQS for O₃, (i.e., annual fourth-highest daily maximum 8-hour average) was 67 ppb which occurred in 2018. The annual trend of the fourth-highest 8-hour average for recent years is shown in Table 3.3-3.

Table 3.3-3 Annual Ozone Concentrations for Comparison to 8-Hour NAAQS Criteria Values – Craters of the Moon National Monument, 2012-2020

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>8-hour O₃ Conc.(ppb)²</td>
<td>70</td>
<td>65</td>
<td>60</td>
<td>62</td>
<td>61</td>
<td>58</td>
<td>63</td>
<td>69</td>
<td>58</td>
<td>66</td>
</tr>
</tbody>
</table>

Source: EPA 2021f

¹ The annual 4th highest 8-hour average averaged over a 3-year period is the NAAQS averaging criteria; these data are annual values, without rolling 3-year averaging.

² These values can be compared to the 2015 8-hour average O₃ NAAQS of 70 ppb.

3.3.4.4 Air Quality Related Values

Air Quality Related Values (AQRVs) are resources sensitive to air quality and include a wide array of resources including, but not limited to, vegetation, soils, water, fish, wildlife, and visibility. Visibility may be affected by impairment due to plume blight or increase in regional haze levels. Plant growth and survival may be adversely affected due to increased ozone concentrations. Deposition of acidic air pollutants may cause episodic or chronic acidification of surface waters and may alter soil chemistry. Elevated deposition of nitrogen or phosphorus can drive species composition changes in both aquatic and terrestrial environments and can change growth and survival rates of plants. Mercury deposition can
impact aquatic and riparian dependent species and can bioaccumulate causing health risks to humans and other species.

The CAA gives federal land managers the affirmative responsibility to protect against degradation of air quality and AQRVs in Class I areas. There are several Class I areas within a 300-km radius of the SGP which were considered for AQRV impact assessments. The nearest Class I areas are Sawtooth Wilderness (SAWT; approximately 80 km south-southeast of the SGP Operations Area Boundary) and Selway-Bitterroot Wilderness (approximately 90 km northeast of the SGP Operations Area Boundary). The Class I areas within a 300-km radius of the SGP Operations Area Boundary are shown in Figure 3.3-2.

The monitoring stations in the far-field analysis area that provide representative background data are listed in Table 3.3-4, and the station locations are mapped in Figure 3.3-3. The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network stations measure chemical constituents that contribute to regional haze and visibility impairment. The National Trends Network (NTN), operated by the National Atmospheric Deposition Program (NADP) provides data on wet atmospheric deposition. The Clean Air Status and Trends Network (CASTNET), provides information on dry atmospheric deposition, including sulfur and nitrogen compounds, as well as ozone. The Mercury Deposition Network (MDN), also operated by NADP, monitors the atmospheric mercury concentration in wet deposition.

**Visibility**

The CAA sets specific goals for protecting Class I areas from human-caused visibility impacts. Scattering of light by aerosols is the main process that limits visibility in the degrading the clarity and color of what can be seen. Some airborne particles are naturally occurring and include seeds, pollen, spores, fragments of plants and animals, sea salt, dust, and smoke. They also are generated from human-caused sources, which include dust from roads, wind erosion of tilled land, biomass burning, fuel combustion, and industrial processes. In addition, emissions of sulfur, nitrogen, and carbon compounds, which are emitted from industrial sources burning fossil fuels, or from natural sources (e.g., wildfire or dust storms), can be precursors of condensed aerosol particles. In Class I wilderness areas and parks, the Regional Haze Rule requires states to address human-caused sources of air pollution degrading visibility on a regional scale. States use the “impairment” metric to factor out natural sources, such as wildfire smoke, and international contributions outside their control, in tracking their progress in improving visibility in the Class I areas.

One unit used to quantify visibility deterioration is the “visual range,” which is a measurable parameter of atmospheric clarity at a specific monitoring location. A shorter visual range corresponds to more impaired long-range visibility through the atmosphere. Visibility has generally improved in Class I areas across the country, in part due to mandated sulfur restrictions on fuels, and controls on industrial sources of air pollution. Average monthly visual range values in the four Class I areas included in the SGP far-field analysis area are between 223 and 278 km, with significant seasonal fluctuation (Air Sciences 2018a; Federal Land Managers' Air Quality Related Values Work Group 2010).

IMPROVE is a cooperative visibility monitoring effort managed by the EPA, with assistance from multiple U.S. agencies, state agencies, Indian tribes, and associated members in Canada and South Korea. The IMPROVE program measures current and long-term trends in visibility by monitoring, on 3-day
intervals, the pollutants that contribute to reduction in visual range. Historic visibility parameters are presented in Table 3.3-5 for the four IMPROVE stations in Class I areas in the SGP far-field analysis area. The IMPROVE network is designed so that some monitoring sites are used to represent multiple Class I areas in a region.

The visibility data in Table 3.3-5 illustrate how observed impairment can vary seasonally and with local conditions in a given locale. Two different measures of impairment are listed. The “most impaired days” represent the portion of days that exhibit the highest 20 percent of observed visibility impairment and reflects only anthropogenic contributions to haze. Another visibility metric, the “monthly average visual range” includes effects of anthropogenic and natural (e.g., wildfire) contributions to haze, and a higher visual range reflects better clarity. The distribution of most impaired days at the Sawtooth (SAWT1) and Selway-Bitterroot (SULA1) wilderness areas tend to have a greater portion of the most impaired days during the warmer summer months. In contrast, the most impaired days occur more frequently during the winter months at CRMO1 and Hells Canyon Wilderness (HECA1).

Plume visibility is a transient condition that is caused by a source or combination of sources and is the presence of a plume that is visible to an observer some distance from the source.

Assessment of plume visibility is a means to quantify the ability of a viewer to discern a visible plume and is usually evaluated for an observer at the closest point on the boundary of a Class I area of concern. Plume blight occurs when a coherent plume from a source is perceptible against a viewing background (e.g., the sky, or a terrain feature such as a mountain) to a casual observer. The primary parameters of plume blight are the change in visible contrast and color contrast between a plume and background.

**Atmospheric Deposition**

There are two types of atmospheric deposition that can affect AQRVs: 1) wet deposition, which involves the scavenging of particles and gases in the air by clouds and precipitation; and 2) dry deposition, which involves the direct collection of gases and particles in the air by vegetation and solids and liquid surfaces (Wallace and Hobbs 2006). Atmospheric deposition may be due to distant or local sources of pollution.

As described in this section, data for the existing conditions at the monitoring stations nearest to the SGP area indicate that both wet and dry nitrogen deposition either show no clear trend or are trending higher. Nationwide, it has been reported that deposition of oxidized nitrogen species has declined between 2006 and 2016, which may reflect improved nitrogen oxides (NOx) emission control technologies for vehicles and power plants. However, over the same period, deposition rates of reduced forms of nitrogen, such as ammonia, have increased or remained unchanged (NADP 2019). The data presented in this section show that no clear trend is evident in wet or dry sulfur species deposition between 2005 and 2015 at the monitoring sites closest to the SGP area. However, nationwide SO2 emissions have decreased by 76 percent between 2010-2020 (EPA 2022).
Figure 3.3-3: Visibility Impairment and Deposition-Related Monitoring Sites

- Stibnite Gold Project
- Sula Peak, Selway-Bitterroot Wilderness
- Lost Trail Pass
- Nez Perce Tribal Land
- Hells Canyon Wilderness
- McCall/Valley County
- Sawtooth Wilderness
- Deer Flats/Canyon County
- Reynolds Creek (co-located)
- Sula Peak, Selway-Bitterroot Wilderness
- Stibnite Gold Project
- Lost Trail Pass
- Nez Perce Tribal Land
- Hells Canyon Wilderness
- McCall/Valley County
- Sawtooth Wilderness
- Deer Flats/Canyon County
- Reynolds Creek (co-located)

LEGEND
- Stibnite Gold Project
- Visibility Impairment Deposition Monitoring Sites
- Interagency Monitoring of Protected Visual Environments
- Clean Air Status and Trends Network
- Mercury Deposition Network
- National Trends Network
- National Atmospheric Deposition Program

Base Layer: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Other Data Sources: Perpetua

1 inch = 25 miles when printed at 11x17
Table 3.3-4  Visibility Impairment and Deposition-Related Monitoring Sites

<table>
<thead>
<tr>
<th>Site ID Code</th>
<th>Network</th>
<th>State</th>
<th>Location/ Site Name</th>
<th>Monitored Parameters</th>
<th>Distance and Direction from SGP to Monitor (mi)</th>
<th>Monitor Elevation (feet)</th>
<th>North Latitude (Decimal Deg.)</th>
<th>West Longitude (Decimal Deg.)</th>
<th>Monitoring Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRMO1</td>
<td>IMPROVE</td>
<td>Idaho</td>
<td>Craters of the Moon National Monument</td>
<td>Haze/Visibility Impairment</td>
<td>132, southeast</td>
<td>5,964</td>
<td>43.4605</td>
<td>-113.5550</td>
<td>5/1992 to present</td>
</tr>
<tr>
<td>HECA1</td>
<td>IMPROVE</td>
<td>Idaho/Oregon</td>
<td>Hells Canyon Wilderness</td>
<td>Haze/Visibility Impairment</td>
<td>75, west</td>
<td>2,149</td>
<td>44.9702</td>
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<tr>
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<td>IMPROVE</td>
<td>Idaho</td>
<td>Sawtooth Wilderness</td>
<td>Haze/Visibility Impairment</td>
<td>52, south-southeast</td>
<td>6,530</td>
<td>44.1705</td>
<td>-114.9271</td>
<td>1/1994 to present</td>
</tr>
<tr>
<td>SULA1</td>
<td>IMPROVE</td>
<td>Montana</td>
<td>Sula Peak, Selway-Bitterroot Wilderness</td>
<td>Haze/Visibility Impairment</td>
<td>90, northeast</td>
<td>6,220</td>
<td>45.8598</td>
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<td>8/1994 to present</td>
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<td>RCK263</td>
<td>CASTNET</td>
<td>Idaho</td>
<td>Reynolds Creek</td>
<td>Dry Deposition</td>
<td>165, south-southwest</td>
<td>3,930</td>
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<td>-116.7510</td>
<td>9/1990 to 12/2016</td>
</tr>
<tr>
<td>NPT006</td>
<td>CASTNET</td>
<td>Idaho</td>
<td>Nez Perce Tribal Land</td>
<td>Dry Deposition</td>
<td>51 north-northwest</td>
<td>3,100</td>
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<td>12/2002 to present</td>
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<td>Wet Deposition</td>
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<td>Lost Trail Pass</td>
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<td>MDN</td>
<td>Idaho</td>
<td>Deer Flats/Canyon County</td>
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<td>MDN</td>
<td>Idaho</td>
<td>McCall/Valley County</td>
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<td>5,013</td>
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<td>11/2007 to 6/2010</td>
</tr>
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</table>

Source: EPA 2018b; IRMA 2018; NADP 2018
### Table 3.3-5  
Historic Visibility Impairment Parameters – Four Class I Area IMPROVE Sites

<table>
<thead>
<tr>
<th></th>
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<td>224</td>
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<td>229</td>
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<td>263</td>
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<td>1.72</td>
<td>242</td>
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<td>9.75</td>
<td>270</td>
</tr>
<tr>
<td>Aug</td>
<td>0.26</td>
<td>261</td>
<td>1.43</td>
<td>243</td>
<td>8.27</td>
<td>278</td>
<td>3.62</td>
<td>271</td>
</tr>
<tr>
<td>Sept</td>
<td>0.26</td>
<td>259</td>
<td>1.43</td>
<td>241</td>
<td>8.00</td>
<td>277</td>
<td>8.91</td>
<td>268</td>
</tr>
<tr>
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<td>255</td>
<td>6.88</td>
<td>235</td>
<td>12.00</td>
<td>273</td>
<td>13.09</td>
<td>262</td>
</tr>
<tr>
<td>Nov</td>
<td>17.32</td>
<td>248</td>
<td>15.47</td>
<td>226</td>
<td>10.93</td>
<td>263</td>
<td>10.58</td>
<td>253</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2018b; Federal Land Manager 2018; IRMA 2018  
CRMO1 = Craters of the Moon National Monument, Monitored Years 2002-17.  
HECA1 = Hells Canyon Wilderness, Monitored Years 2000-17.  
IMPROVE = Interagency Monitoring of Protected Visual Environments.  
Two complementary monitoring networks that collect deposition data are CASTNET and NTN, which collect data related to dry and wet deposition, respectively. Total deposition estimates are provided nationwide by NADP’s Total Deposition Science Committee. They use a hybrid approach combining ambient measurements from CASTNET, NTN, and other air concentration monitoring data with model output to provide gridded estimates of total deposition (NADP 2022; Schwede and Lear 2014). Nearly all CASTNET sites are co-located or are near a corresponding NTN site, which together provide the data needed to track temporal and spatial trends in total deposition.

Deposition of nitrogen and sulfur compounds impact the environment through several pathways. In the atmosphere, \( \text{NO}_x \) reacts with moisture and oxygen to form nitric acid, nitrates, and nitrous oxide, while \( \text{SO}_2 \) reacts to form sulfuric acid, sulfates, and sulfites, which can be transported to the surface by wet deposition. Nitrogen and sulfur compounds formed in the atmosphere are conveyed by dry and wet deposition and can affect soils, water, and biota far from the origination of the precursor emissions. Excessive nitrogen deposition can cause reduction in plant biodiversity and eutrophication (excessive plant and algae growth) in surface waters. This has the effect of reducing the oxygen content of the water, and therefore reduces the population of animal life the water can sustain.

Of somewhat less concern in the Pacific Northwest is acid deposition, which occurs when \( \text{SO}_2, \text{NO}_x, \) and ammonia in the atmosphere react to form sulfuric acid, nitric acid, and ammonium. These compounds can enter surface waters, primarily through wet deposition. These pollutants originate from anthropogenic sources (e.g., burning of fossil fuels in power plants and motor vehicles, and agricultural practices), and to a lesser degree from natural sources (e.g., forest fires and volcanoes).

**National Trends Network**

The NTN provides a nationwide historic record of precipitation chemistry that is reflected in wet deposition rates to soil and surface water. The NTN is part of the NADP that operates several atmospheric monitoring programs. NTN sites are typically located away from urban areas and large point sources of pollution, and many stations are in Class I areas. While stations cannot be established and operated in protected wilderness areas, NTN sites are in many cases located near, or are considered representative of, nearby wilderness area deposition conditions at similar elevations. Each monitoring site measures the quantity of precipitation, and automatically captures samples only during precipitation events. Samples are retrieved from the field on a weekly interval, and analyzed for calcium, magnesium, potassium, sodium, ammonium, nitrate, total nitrogen species, chloride, sulfate, and free acidity (H\(^+\)) (NADP 2022). Wet deposition data is expressed in units of kilograms per hectare per year (kg/ha-yr).

Annual data for three NTN sites closest to the SGP is presented in Tables 3.3-6 through Table 3.3-8. These three sites are located at the CRMO (213 km distant, southeast) Reynolds Creek (264 km distant, south-southwest), and Lost Trail Pass (142 km distant, northeast). Trends in the wet deposition rates of the primary nitrogen and sulfur species (nitrate [\( \text{NO}_3 \)], ammonium [\( \text{NH}_4 \)], and sulfate [\( \text{SO}_4 \)]) are plotted in Figures 3.3-4 through 3.3-6 for the three NTN sites. These trends show the wide variability in annual wet deposition rates in the region, with no clear long-term trend.
Clean Air Status and Trends Network Data

CASTNET is a long-term, dry deposition national monitoring network managed by EPA. The CASTNET sites measure nitrogen and sulfur species, chloride, and base cations (i.e., a positively charged ion) that are used to calculate dry deposition rates. The network was established under the 1990 CAA Amendments to provide accountability for emission reduction programs by reporting trends in pollutant concentrations and acidic deposition (EPA 2018b). Table 3.3-9 shows dry nitrogen compound and dry sulfur compound deposition rates at the two CASTNET monitoring sites closest to the SGP and located in Idaho. These are stations on Nez Perce Tribal Reservation land (82 km distant, north-northwest, and at Reynolds Creek (264 km distant, south-southwest). Like wet deposition, dry deposition is typically expressed in units of kg/ha-yr. Figure 3.3-7 illustrates the trends in annual dry deposition rates at these sites, with dry deposition of sulfur species generally higher than nitrogen species.

Mercury Deposition Network

Inorganic Hg in gaseous and particle-bound forms and mercury oxide can be emitted from mine operations and fossil fuel combustion sources, most notably coal-fired electrical-generating units. Each Hg form has specific physical and chemical properties that determine how far it travels in the atmosphere before depositing to the landscape.

Atmospheric deposition of mercury is of particular concern where the potential exists for contamination of riparian areas and/or surface waters through precipitation and runoff. Although gaseous oxidized Hg and particle-bound Hg deposition are prevalent, all forms of Hg can deposit to local or regional watersheds (Zhang 2009). Once deposited in a body of water, inorganic forms of mercury are converted to a chemical form (methyl mercury) that can become concentrated in fish and can harm the health of individuals who consume these fish, particularly children. In relatively arid regions, such as Idaho, dry Hg deposition may be a larger contributor to atmospheric deposition of mercury compared to wet deposition. National Hg emissions from domestic human-caused sources declined from about 63 tons in 2008 to about 55 tons in 2014, the latest data year available in the EPA National Emissions Inventory (EPA 2017). More than 75 percent of this decline (5.9 tons per year) can be attributed to reductions in Hg emissions from fossil-fueled electric generation plants (EPA 2017).

Annual averages of sampling data are available from the MDN in the region corresponding to the SGP far field analysis area. Three MDN sites have been located at CRMO, Deer Flats (294 km distant, south-southwest), and McCall, Idaho (59.5 km distant, west). The most recent measurements were between 2007 and 2010 and are provided in Table 3.3-10 to serve as an estimate of historical Hg deposition in the region surrounding the SGP area. Total Hg deposition in precipitation (organic + inorganic) is calculated for the MDN in units of micrograms per square meter per year (µg/m2-yr) based on measured mass of Hg deposited over a known sample area (NADP 2018).
<table>
<thead>
<tr>
<th>Year</th>
<th>Ca (kg/ha-yr)</th>
<th>Mg (kg/ha-yr)</th>
<th>K (kg/ha-yr)</th>
<th>Na (kg/ha-yr)</th>
<th>NH4 (kg/ha-yr)</th>
<th>NO3 (kg/ha-yr)</th>
<th>Total N (kg/ha-yr)</th>
<th>Cl- (kg/ha-yr)</th>
<th>SO4 (kg/ha-yr)</th>
<th>H+ (kg/ha-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0.336</td>
<td>0.034</td>
<td>0.054</td>
<td>0.092</td>
<td>0.839</td>
<td>1.485</td>
<td>0.987</td>
<td>0.149</td>
<td>0.899</td>
<td>0.005</td>
</tr>
<tr>
<td>2007</td>
<td>0.266</td>
<td>0.027</td>
<td>0.035</td>
<td>0.087</td>
<td>0.605</td>
<td>1.223</td>
<td>0.746</td>
<td>0.112</td>
<td>0.618</td>
<td>0.004</td>
</tr>
<tr>
<td>2008</td>
<td>0.348</td>
<td>0.038</td>
<td>0.038</td>
<td>0.086</td>
<td>0.752</td>
<td>1.534</td>
<td>0.931</td>
<td>0.167</td>
<td>0.838</td>
<td>0.011</td>
</tr>
<tr>
<td>2009</td>
<td>1.81</td>
<td>0.141</td>
<td>0.18</td>
<td>2.768</td>
<td>1.114</td>
<td>1.872</td>
<td>1.289</td>
<td>2.271</td>
<td>2.955</td>
<td>0.007</td>
</tr>
<tr>
<td>2010</td>
<td>0.506</td>
<td>0.047</td>
<td>0.04</td>
<td>0.209</td>
<td>0.759</td>
<td>1.664</td>
<td>0.966</td>
<td>0.253</td>
<td>0.87</td>
<td>0.012</td>
</tr>
<tr>
<td>2011</td>
<td>0.298</td>
<td>0.035</td>
<td>0.038</td>
<td>0.092</td>
<td>0.667</td>
<td>1.089</td>
<td>0.764</td>
<td>0.148</td>
<td>0.676</td>
<td>0.004</td>
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<tr>
<td>2012</td>
<td>2.084</td>
<td>0.175</td>
<td>0.14</td>
<td>0.608</td>
<td>0.72</td>
<td>1.204</td>
<td>0.831</td>
<td>0.806</td>
<td>0.986</td>
<td>0.003</td>
</tr>
<tr>
<td>2013</td>
<td>0.596</td>
<td>0.063</td>
<td>0.072</td>
<td>0.181</td>
<td>0.872</td>
<td>1.517</td>
<td>1.02</td>
<td>0.256</td>
<td>0.809</td>
<td>0.002</td>
</tr>
<tr>
<td>2014</td>
<td>0.413</td>
<td>0.048</td>
<td>0.075</td>
<td>0.13</td>
<td>0.959</td>
<td>1.348</td>
<td>1.049</td>
<td>0.214</td>
<td>0.715</td>
<td>0.006</td>
</tr>
<tr>
<td>2015</td>
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<td>0.09</td>
<td>0.157</td>
<td>0.913</td>
<td>1.279</td>
<td>1.979</td>
<td>1.441</td>
<td>0.72</td>
<td>1.825</td>
<td>0.006</td>
</tr>
<tr>
<td>2016</td>
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<td>0.265</td>
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<td>1.324</td>
<td>1.858</td>
<td>1.449</td>
<td>1.531</td>
<td>1.32</td>
<td>0.010</td>
</tr>
<tr>
<td>2017</td>
<td>0.743</td>
<td>0.111</td>
<td>0.084</td>
<td>0.68</td>
<td>1.005</td>
<td>1.45</td>
<td>1.109</td>
<td>0.618</td>
<td>1.205</td>
<td>0.013</td>
</tr>
<tr>
<td>2018</td>
<td>0.58</td>
<td>0.067</td>
<td>0.064</td>
<td>0.253</td>
<td>1.142</td>
<td>1.409</td>
<td>1.207</td>
<td>0.536</td>
<td>0.671</td>
<td>0.005</td>
</tr>
<tr>
<td>2019</td>
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<td>0.046</td>
<td>0.076</td>
<td>1.089</td>
<td>1.427</td>
<td>1.169</td>
<td>0.186</td>
<td>0.671</td>
<td>0.012</td>
</tr>
<tr>
<td>2020</td>
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<td>0.139</td>
<td>0.106</td>
<td>0.7</td>
<td>0.856</td>
<td>0.94</td>
<td>0.878</td>
<td>0.66</td>
<td>0.85</td>
<td>0.004</td>
</tr>
<tr>
<td>Mean</td>
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<td>0.081</td>
<td>0.093</td>
<td>0.56</td>
<td>0.93</td>
<td>1.47</td>
<td>1.06</td>
<td>0.58</td>
<td>1.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Median</td>
<td>0.58</td>
<td>0.063</td>
<td>0.072</td>
<td>0.21</td>
<td>0.87</td>
<td>1.45</td>
<td>1.02</td>
<td>0.26</td>
<td>0.85</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Source: NADP 2022
kg/ha-yr = kilograms per hectare per year
(1 kg = 2.2 lbs.; 1 hectare = 2.5 acres)
Ca = calcium Na = sodium
Cl- = chloride NH₄ = ammonium
H+ = free acidity NO₃ = nitrate
K = potassium SO₄ = sulfate
Mg = magnesium N = nitrogen
Figure Source: NADP 2022
kg/ha-yr = kilograms per hectare per year; NH4 = ammonium; NO3 = nitrate; SO4 = sulfate

Figure 3.3-4  Trends in Wet Deposition Rates – Craters of the Moon National Monument, 2006-2020
Table 3.3-7  NTN Speciated Wet Deposition, Annual Average – Reynolds Creek (Site ID11)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ca (kg/ha-yr)</th>
<th>Mg (kg/ha-yr)</th>
<th>K (kg/ha-yr)</th>
<th>Na (kg/ha-yr)</th>
<th>NH₄ (kg/ha-yr)</th>
<th>NO₃ (kg/ha-yr)</th>
<th>Total N (kg/ha-yr)</th>
<th>Cl⁻ (kg/ha-yr)</th>
<th>SO₄ (kg/ha-yr)</th>
<th>H⁺ (kg/ha-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0.323</td>
<td>0.033</td>
<td>0.042</td>
<td>0.207</td>
<td>0.332</td>
<td>0.855</td>
<td>0.451</td>
<td>0.148</td>
<td>0.615</td>
<td>0.005</td>
</tr>
<tr>
<td>2007</td>
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<td>0.033</td>
<td>0.05</td>
<td>0.214</td>
<td>0.674</td>
<td>1.021</td>
<td>0.754</td>
<td>0.157</td>
<td>0.704</td>
<td>0.005</td>
</tr>
<tr>
<td>2008</td>
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<td>0.017</td>
<td>0.041</td>
<td>0.197</td>
<td>0.434</td>
<td>0.653</td>
<td>0.485</td>
<td>0.087</td>
<td>0.534</td>
<td>0.004</td>
</tr>
<tr>
<td>2009</td>
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<td>0.118</td>
<td>0.584</td>
<td>0.802</td>
<td>1.188</td>
<td>0.891</td>
<td>0.237</td>
<td>1.284</td>
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<tr>
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<td>0.09</td>
<td>0.878</td>
<td>0.912</td>
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<td>0.391</td>
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<td>0.007</td>
</tr>
<tr>
<td>2011</td>
<td>0.297</td>
<td>0.035</td>
<td>0.056</td>
<td>0.402</td>
<td>0.481</td>
<td>0.762</td>
<td>0.546</td>
<td>0.3</td>
<td>0.627</td>
<td>0.006</td>
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<tr>
<td>2012</td>
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<td>0.084</td>
<td>0.119</td>
<td>1.756</td>
<td>0.507</td>
<td>0.895</td>
<td>0.596</td>
<td>0.482</td>
<td>1.953</td>
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<tr>
<td>2013</td>
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<td>0.118</td>
<td>0.321</td>
<td>1.347</td>
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<td>1.556</td>
<td>0.244</td>
<td>1.357</td>
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<td>2014</td>
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<td>0.15</td>
<td>0.32</td>
<td>0.979</td>
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<td>1.22</td>
<td>0.29</td>
<td>1.049</td>
<td>0.005</td>
</tr>
<tr>
<td>2015</td>
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<td>0.078</td>
<td>0.13</td>
<td>1.519</td>
<td>1.061</td>
<td>1.399</td>
<td>1.141</td>
<td>0.515</td>
<td>1.998</td>
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</tr>
<tr>
<td>2016</td>
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<td>0.086</td>
<td>0.704</td>
<td>0.562</td>
<td>0.956</td>
<td>0.653</td>
<td>0.297</td>
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</tr>
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<td>0.116</td>
<td>0.535</td>
<td>0.948</td>
<td>1.512</td>
<td>1.078</td>
<td>0.354</td>
<td>1.002</td>
<td>0.009</td>
</tr>
<tr>
<td>2018</td>
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<td>0.032</td>
<td>0.056</td>
<td>0.275</td>
<td>0.771</td>
<td>0.933</td>
<td>0.81</td>
<td>0.153</td>
<td>0.608</td>
<td>0.003</td>
</tr>
<tr>
<td>2019</td>
<td>0.243</td>
<td>0.028</td>
<td>0.076</td>
<td>0.149</td>
<td>1.533</td>
<td>1.554</td>
<td>1.543</td>
<td>0.163</td>
<td>0.758</td>
<td>0.006</td>
</tr>
<tr>
<td>2020</td>
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<td>0.029</td>
<td>0.085</td>
<td>0.498</td>
<td>0.264</td>
<td>0.557</td>
<td>0.331</td>
<td>0.252</td>
<td>0.667</td>
<td>0.008</td>
</tr>
<tr>
<td>Mean</td>
<td>0.47</td>
<td>0.051</td>
<td>0.089</td>
<td>0.57</td>
<td>0.77</td>
<td>1.20</td>
<td>0.87</td>
<td>0.27</td>
<td>1.07</td>
<td>0.005</td>
</tr>
<tr>
<td>Median</td>
<td>0.47</td>
<td>0.047</td>
<td>0.086</td>
<td>0.40</td>
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<td>1.02</td>
<td>0.81</td>
<td>0.25</td>
<td>1.00</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Source: NADP 2022
kg/ha-yr = kilograms per hectare per year
(1 kg = 2.2 lbs.; 1 hectare = 2.5 acres)
Ca = calcium    Na = sodium
Cl⁻ = chloride  NH₄ = ammonium
H⁺ = free acidity NO₃ = nitrate
K = potassium   SO₄ = sulfate
Mg = magnesium  N = nitrogen
Figure 3.3-5  Trends in Wet Deposition Rates – Reynolds Creek, 2006-2020

Figure Source: NADP 2022

kg/ha-yr = kilograms per hectare per year; NH₄ = ammonium; NO₃ = nitrate; SO₄ = sulfate
### Table 3.3-8  NTN Speciated Wet Deposition, Annual Average – Lost Trail Pass (Site MT97)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ca (kg/ha-yr)</th>
<th>Mg (kg/ha-yr)</th>
<th>K (kg/ha-yr)</th>
<th>Na (kg/ha-yr)</th>
<th>NH₄ (kg/ha-yr)</th>
<th>NO₃ (kg/ha-yr)</th>
<th>Total N (kg/ha-yr)</th>
<th>Cl⁻ (kg/ha-yr)</th>
<th>SO₄ (kg/ha-yr)</th>
<th>H⁺ (kg/ha-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0.628</td>
<td>0.080</td>
<td>0.329</td>
<td>0.309</td>
<td>0.737</td>
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<td>1.255</td>
<td>0.528</td>
<td>2.301</td>
<td>0.050</td>
</tr>
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<td>0.048</td>
<td>0.078</td>
<td>0.174</td>
<td>0.523</td>
<td>1.638</td>
<td>0.777</td>
<td>0.252</td>
<td>1.318</td>
<td>0.035</td>
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<td>0.103</td>
<td>0.144</td>
<td>0.484</td>
<td>1.914</td>
<td>0.808</td>
<td>0.247</td>
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<td>2009</td>
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<td>0.226</td>
<td>0.383</td>
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<td>0.921</td>
<td>0.52</td>
<td>2.003</td>
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</tr>
<tr>
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<td>1.778</td>
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<tr>
<td>2011</td>
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<td>0.114</td>
<td>0.125</td>
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<td>0.751</td>
<td>1.89</td>
<td>1.011</td>
<td>0.569</td>
<td>1.776</td>
<td>0.042</td>
</tr>
<tr>
<td>2012</td>
<td>0.806</td>
<td>0.086</td>
<td>0.108</td>
<td>0.441</td>
<td>0.613</td>
<td>1.763</td>
<td>0.874</td>
<td>0.441</td>
<td>1.408</td>
<td>0.034</td>
</tr>
<tr>
<td>2013</td>
<td>0.338</td>
<td>0.047</td>
<td>0.15</td>
<td>0.197</td>
<td>0.648</td>
<td>1.597</td>
<td>0.864</td>
<td>0.357</td>
<td>1.146</td>
<td>0.033</td>
</tr>
<tr>
<td>2014</td>
<td>0.452</td>
<td>0.068</td>
<td>0.164</td>
<td>0.233</td>
<td>0.725</td>
<td>2.066</td>
<td>1.03</td>
<td>0.315</td>
<td>1.341</td>
<td>0.056</td>
</tr>
<tr>
<td>2015</td>
<td>0.37</td>
<td>0.047</td>
<td>0.133</td>
<td>0.645</td>
<td>0.768</td>
<td>1.508</td>
<td>0.938</td>
<td>0.313</td>
<td>1.015</td>
<td>0.038</td>
</tr>
<tr>
<td>2016</td>
<td>4.02</td>
<td>1.306</td>
<td>0.354</td>
<td>1.679</td>
<td>0.69</td>
<td>1.399</td>
<td>0.852</td>
<td>0.802</td>
<td>1.781</td>
<td>0.034</td>
</tr>
<tr>
<td>2017</td>
<td>5.468</td>
<td>1.562</td>
<td>0.373</td>
<td>1.761</td>
<td>0.898</td>
<td>2.134</td>
<td>1.18</td>
<td>1.119</td>
<td>2.367</td>
<td>0.047</td>
</tr>
<tr>
<td>2018</td>
<td>0.632</td>
<td>0.072</td>
<td>0.155</td>
<td>0.262</td>
<td>0.978</td>
<td>2.337</td>
<td>1.288</td>
<td>0.37</td>
<td>1.276</td>
<td>0.046</td>
</tr>
<tr>
<td>2019</td>
<td>0.278</td>
<td>0.037</td>
<td>0.093</td>
<td>0.121</td>
<td>0.63</td>
<td>1.455</td>
<td>0.819</td>
<td>0.213</td>
<td>0.769</td>
<td>0.038</td>
</tr>
<tr>
<td>2020</td>
<td>0.405</td>
<td>0.058</td>
<td>0.104</td>
<td>0.173</td>
<td>0.567</td>
<td>1.469</td>
<td>0.772</td>
<td>0.243</td>
<td>0.833</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean</td>
<td>1.08</td>
<td>0.25</td>
<td>0.17</td>
<td>0.48</td>
<td>0.66</td>
<td>1.89</td>
<td>0.94</td>
<td>0.44</td>
<td>1.47</td>
<td>0.042</td>
</tr>
<tr>
<td>Median</td>
<td>0.45</td>
<td>0.06</td>
<td>0.13</td>
<td>0.26</td>
<td>0.65</td>
<td>1.78</td>
<td>0.87</td>
<td>0.36</td>
<td>1.34</td>
<td>0.040</td>
</tr>
</tbody>
</table>

Source: NADP 2022
kg/ha-yr = kilograms per hectare per year
(1 kg = 2.2 lbs.; 1 hectare = 2.5 acres)
Ca = calcium    Na = sodium
Cl⁻ = chloride   NH₄ = ammonium
H⁺ = free acidity NO₃ = nitrate
K = potassium    SO₄ = sulfate
Mg = magnesium   N = nitrogen
Figure 3.3-6  Trends in Wet Deposition Rates – Lost Trail Pass, 2006-2020

kg/ha-yr = kilograms per hectare per year; NH₄ = ammonium; NO₃ = nitrate; SO₄ = sulfate
Table 3.3-9  CASTNET Dry Deposition Rates, Annual Average – Two Idaho Sites

<table>
<thead>
<tr>
<th>Year</th>
<th>Site NTP006 Dry Nitrogen Deposition Rate (kg/ha-yr)</th>
<th>Site NTP006 Dry Sulfur Deposition Rate (kg/ha-yr)</th>
<th>Site RCK263 Dry Nitrogen Deposition Rate (kg/ha-yr)</th>
<th>Site RCK263 Dry Sulfur Deposition Rate (kg/ha-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.553</td>
<td>1.425</td>
<td>0.233</td>
<td>0.751</td>
</tr>
<tr>
<td>2008</td>
<td>0.633</td>
<td>1.752</td>
<td>0.177</td>
<td>0.481</td>
</tr>
<tr>
<td>2009</td>
<td>0.513</td>
<td>1.334</td>
<td>0.350</td>
<td>0.643</td>
</tr>
<tr>
<td>2010</td>
<td>0.69</td>
<td>2.081</td>
<td>0.603</td>
<td>1.042</td>
</tr>
<tr>
<td>2011</td>
<td>0.547</td>
<td>1.704</td>
<td>0.210</td>
<td>0.545</td>
</tr>
<tr>
<td>2012</td>
<td>0.697</td>
<td>2.053</td>
<td>0.650</td>
<td>0.598</td>
</tr>
<tr>
<td>2013</td>
<td>0.733</td>
<td>2.837</td>
<td>0.453</td>
<td>1.560</td>
</tr>
<tr>
<td>2014</td>
<td>0.527</td>
<td>2.056</td>
<td>0.350</td>
<td>1.221</td>
</tr>
<tr>
<td>2015</td>
<td>0.377</td>
<td>1.941</td>
<td>0.267</td>
<td>0.806</td>
</tr>
<tr>
<td>2016</td>
<td>0.513</td>
<td>1.853</td>
<td>0.340</td>
<td>0.652</td>
</tr>
<tr>
<td>Mean</td>
<td>0.578</td>
<td>1.904</td>
<td>0.363</td>
<td>0.830</td>
</tr>
<tr>
<td>Median</td>
<td>0.550</td>
<td>1.897</td>
<td>0.345</td>
<td>0.702</td>
</tr>
</tbody>
</table>

Source: EPA 2018b  
kg/ha-yr = kilograms per hectare per year  
(1 kg = 2.2 lbs.; 1 hectare = 2.5 acres)  
Site NTP0-6 - Nez Perce Tribal Land  
Site RCK2-3 - Reynolds Creek
Figure 3.3-7  Trends in Dry Nitrogen and Sulfur Deposition Rates, 2006-2015

Figure Source: EPA 2018b
kg/ha-yr = kilograms per hectare per year
Site NTP0–6 - Nez Perce Tribal Land; Site RCK2–3 - Reynolds Creek
### Table 3.3-10  Historical Annual Average Concentration and Mercury Deposition Rates – Three Idaho MDN Sites

<table>
<thead>
<tr>
<th>Year</th>
<th>Station Name (MDN ID)  1,2</th>
<th>Precipitation Collected (dm/yr)</th>
<th>Average Precipitation Mercury Concentration (ng/L)</th>
<th>Mercury Deposition Rate (µg/m²-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Craters of the Moon NM (ID03)</td>
<td>2.01</td>
<td>14.10</td>
<td>2.83</td>
</tr>
<tr>
<td>2008</td>
<td>Craters of the Moon NM (ID03)</td>
<td>5.51</td>
<td>6.45</td>
<td>3.36</td>
</tr>
<tr>
<td>2009</td>
<td>Craters of the Moon NM (ID03)</td>
<td>3.91</td>
<td>16.71</td>
<td>6.53</td>
</tr>
<tr>
<td>2009</td>
<td>Deer Flats, ID (ID98)</td>
<td>2.15</td>
<td>10.56</td>
<td>2.27</td>
</tr>
<tr>
<td>2009</td>
<td>McCall, ID (ID99)</td>
<td>6.52</td>
<td>8.09</td>
<td>5.27</td>
</tr>
<tr>
<td>2010</td>
<td>Craters of the Moon NM (ID03)</td>
<td>3.91</td>
<td>14.03</td>
<td>5.48</td>
</tr>
<tr>
<td>Mean</td>
<td>All Stations</td>
<td>3.95</td>
<td>11.65</td>
<td>4.29</td>
</tr>
</tbody>
</table>

Source: NADP 2018

1 Individual annual measurements for precipitation and mercury deposition data available for three sites: ID03 Craters of the Moon National Monument; ID98 Deer Flats, Idaho; ID99 McCall Idaho.

2 The three MDN sites within the far field analysis area ceased operation by 2010.

µg/m²-yr = deposition rate as micrograms mercury per square meter per year.

dm = decimeter (1 decimeter = 3.94 inches).

ng/L = nanograms per liter precipitation.

### Mercury Ambient Concentrations

In addition to deposition data, ambient mercury concentrations are measured via the NADP, specifically the Atmospheric Mercury Network (AMNet). AMNet has captured concentration data throughout North America beginning 2006. AMNet has been in 39 sites throughout the years and 12 currently active locations. Each site measures hourly gaseous elemental mercury (GEM) and also measures 2-hr gaseous oxidized mercury (GOM) and particulate bound mercury (PBM2.5). The nearest geographic site to the SGP area is no longer active but was active from December 2008 to August 14, 2017. Table 3.3-11 illustrates the annual average concentrations of each component from December 2008 through November 2015. Only a very limited percentage of data was available from December 2015 through August 2017. For further information and concentrations for other locations please refer to [http://nadp.slh.wisc.edu](http://nadp.slh.wisc.edu).

### Table 3.3-11  Annual Average Mercury Concentration – Salt Lake City AMNet Site

<table>
<thead>
<tr>
<th>Year</th>
<th>GEM Hourly Average Concentration (ng/m³)</th>
<th>GOM Average Concentration (pg/m³)</th>
<th>PBM2.5 Average Concentration (pg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2009 – Nov 2010</td>
<td>2.07</td>
<td>26.63</td>
<td>6.35</td>
</tr>
<tr>
<td>Dec 2010 – Nov 2011</td>
<td>1.83</td>
<td>17.06</td>
<td>8.44</td>
</tr>
<tr>
<td>Dec 2011 – Nov 2012</td>
<td>1.80</td>
<td>18.68</td>
<td>16.45</td>
</tr>
<tr>
<td>Dec 2012 – Nov 2013</td>
<td>1.87</td>
<td>16.80</td>
<td>22.22</td>
</tr>
<tr>
<td>Dec 2013 – Nov 2014</td>
<td>1.73</td>
<td>14.52</td>
<td>12.82</td>
</tr>
<tr>
<td>Dec 2014 – Nov 2015</td>
<td>1.74</td>
<td>15.17</td>
<td>8.87</td>
</tr>
</tbody>
</table>
### Climate and Meteorology

The SGP is located in the central portion of the Salmon River Mountain Range, in central Idaho, approximately 10 air miles east of the village of Yellow Pine. The SGP Operations Area Boundary and the broader analysis area are classified as a Warm-Summer Continental Climate (Weatherbase.com). In this region, the climate typically ranges from warm, dry summers to cold, wet winters. However, the locale of the SGP is semi-arid as a result of the Cascade and Sierra Nevada mountains to the west and the Bitterroot and Rocky Mountains to the north, which effectively prevents large scale intrusion of Pacific moisture.

As described by the Western Regional Climate Center (WRCC), organized storm fronts frequently move through the region during winter, resulting in cold outbreaks, and can produce snowfall over two feet. Cloudy and unsettled weather is common during the winter with measurable precipitation occurring roughly a third of the days. The summer months are typically dominated by high pressure over the Great Basin resulting in warm days with very little precipitation. In general, temperatures in the cooler months average below 30 degrees Fahrenheit (°F) and average above 50°F during the warmer months (WRCC 2018a, 2018b).

Spring months are normally wet and windy with periods of high winds that may persist for days at a time. Weather conditions fluctuate quickly during the spring. Afternoon temperatures in the range of 30 to 50°F with precipitation in the form of rain or snow may occur interspersed with periods of sunny skies and afternoon temperatures between 50 to 70°F. Thunderstorms are not uncommon and are usually accompanied by rain showers and occasional snow. Low elevation snowpack usually melts quickly during the spring, but high elevation snowpack can persist into June or later in the year (WRCC 2018a, 2018b).

The nearest location with a long-term climatological data record is the McCall, Idaho, municipal airport station, which is located approximately 37 air miles west and 1,575 vertical feet below the SGP. The McCall National Weather Service (NWS) station also monitors surface temperature, dew point and wind speed, direction, and highest gust speed (NOAA 2018). While regionally representative, it can be assumed that the McCall airport data would be slightly warmer with lower amounts of precipitation due to its lower elevation compared to the SGP. The average maximum annual temperature is 54°F and during the warmest month (July) the average maximum monthly temperature is 81°F. The average minimum annual temperature is 27°F and during the coldest month (January) the average minimum monthly temperature is 11°F (NOAA 2018). Table 3.3-12 provides the daily average temperature range parameters for the McCall station for the years 1997 to 2008 (WRCC 2018b). The daily average minimum and maximum temperatures for each month recorded in for McCall also are plotted in Figure 3.3-8.
### Table 3.3-12  Average Temperature Data from McCall National Weather Service Site

<table>
<thead>
<tr>
<th>Data</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Max Temp (F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>51.9</td>
</tr>
<tr>
<td>Avg Min Temp (F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25.5</td>
</tr>
<tr>
<td>Avg. Max Temp (F)</td>
<td>28.6</td>
<td>32.5</td>
<td>39.3</td>
<td>47.8</td>
<td>58.8</td>
<td>67.6</td>
<td>80.4</td>
<td>78.1</td>
<td>67.9</td>
<td>54.5</td>
<td>39.5</td>
<td>28.2</td>
<td>51.9</td>
</tr>
<tr>
<td>Avg. Min Temp (F)</td>
<td>10.4</td>
<td>9.9</td>
<td>16.6</td>
<td>24.5</td>
<td>32.6</td>
<td>37.6</td>
<td>44.1</td>
<td>41.2</td>
<td>33.5</td>
<td>25.6</td>
<td>19.4</td>
<td>11.0</td>
<td>25.5</td>
</tr>
</tbody>
</table>

Source: McCall Municipal Airport (WRCC 2018b)

1 Data from the McCall Municipal Airport, National Weather Service Station averaged from 1997 to 2008.

°F = degrees Fahrenheit. Avg. = average.

---

**Figure 3.3-8  Temperature Range Data for McCall, Idaho, and Monthly Precipitation for Big Creek Summit SNOTEL Site**

Figure Source: NRCS 2021; WRCC 2018b
The Big Creek Summit Site is operated by the National Water and Climate Center’s Snow Telemetry (SNOTEL) network. The site is located 28 miles southwest of the SGP at approximately the same elevation and latitude. The site provides data for surface temperature, precipitation, snow water equivalent, and snow depth. The monthly average precipitation and snowfall information for the Big Creek Summit Site can be considered representative of the SGP and is shown in Table 3.3-13 (National Resources Conservation Service [NRCS] 2021). Although the climatological data is quoted for different spans of years, this available data provides covers sufficiently long periods to provide representative average values for historical climate description.

Table 3.3-13  Average Precipitation Data from Big Creek Summit SNOTEL Site

<table>
<thead>
<tr>
<th>Data</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Precipitation (in)1</td>
<td>6.9</td>
<td>5.1</td>
<td>5.7</td>
<td>4.4</td>
<td>3.4</td>
<td>2.6</td>
<td>0.7</td>
<td>0.8</td>
<td>1.4</td>
<td>3.1</td>
<td>5.5</td>
<td>7.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Snow Water Equivalent (avg, in)1</td>
<td>13.0</td>
<td>20.0</td>
<td>25.3</td>
<td>30.4</td>
<td>27.9</td>
<td>10.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>7.8</td>
<td>11.3</td>
</tr>
<tr>
<td>Snow Depth (avg, in)2</td>
<td>49.4</td>
<td>66.7</td>
<td>77.3</td>
<td>82.3</td>
<td>63.2</td>
<td>18.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>2.6</td>
<td>19.3</td>
<td>31.6</td>
</tr>
</tbody>
</table>

Source: Big Creek Summit Site (NRCS 2021)
1 Data from the Big Creek Summit SNOTEL Station averaged from 1991 to 2020.
2 Data from the Big Creek Summit SNOTEL Station averaged from July 2000 to January 2020.
Avg. = average. In = inches.

Temperature

Between 2010 and 2014, the maximum hourly temperature recorded at the McCall site was 95°F during 2013. Typically, the maximum hourly temperature occurred during July or August. The minimum hourly temperature recorded at the McCall site was -18°F during 2010. In winter, the minimum hourly temperature occurred on numerous days between December and February. Diurnal temperature ranges were the largest in the warmer months (April to September) and decreased during the cooler months (WRCC 2018b). The maximum and minimum daily average temperatures between 1997 and 2008 are shown on Figure 3.3-8.

The hourly temperatures recorded at the Big Creek Summit site would be comparable to the SGP, as this station is at the same elevation. Between 2010 and 2014 highest hourly temperature was 90°F, recorded during 2013. Typically, the maximum hourly temperature occurred during July or August. The minimum hourly temperature recorded at the Big Creek Summit site was -13°F during 2010. Typically, the minimum hourly temperature occurred on numerous days between December and February. Diurnal temperature ranges were the largest in the warmer months (April to September) and decreased during the cooler months (NOAA 2018).

Precipitation

Precipitation data for the Big Creek Summit SNOTEL site over the period 1991 to 2020 show that monthly average totals range from 5 to 8 inches per month during the cool months (November - March)
primarily in the form of snow. The summer is dry, with monthly average precipitation typically less than two inches per month from June through September. Annual precipitation accumulation recorded at the Big Creek Summit site was approximately 51.4 inches in 2010, 47.1 inches in 2011, 54.9 inches in 2012, 35.6 inches in 2013, and 52.8 inches in 2014.

**Wind**

Baseline wind speed and direction data at the Stibnite monitoring station were collected from November 2013 to June 2015. During this period, the strongest winds were from the southwest and from the west-southwest. The mean wind speed was 2.3 meters per second (5.2 miles per hour). Wind directions had a strong tendency from the southwest. Speeds varied widely but tended to be strongest from the southwest. The Stibnite wind distribution data collected at the on-site meteorological station from January 2014 to December 2014 are shown in Figure 3.3-9 (Air Sciences 2018a).

![Wind Distribution – Stibnite SGP, 2014](image-url)
3.4 Climate Change

3.4.1 Introduction

Given that climate change impacts are likely to persist in the region, analysis area resource conditions are expected to be affected. Climate change trends are discussed below by resource. Due to the nature of the resource, climate change is not expected to impact noise, thus this resource is not discussed.

3.4.2 Climate Change Area of Analysis

The climate change analysis area varies depending on the resource affected as described in each resource in this chapter.

3.4.3 Relevant Laws, Regulations, Policies, and Plans

There are currently no federal or state regulatory programs that require GHG emission reductions or controls on new or existing facilities in Idaho. The sections below describe the existing regulatory guidance for GHGs and climate change under the NEPA and from the Forest Service, as well as other guidance from the EPA and state of Idaho for monitoring, reporting, and reducing GHG emissions. Additional descriptions of these guidance documents can be found in the SGP Climate Change Specialist Report (Forest Service 2022b).

Land and Resource Management Plan: There are no specific standards or guidelines related to climate change in the Payette Forest Plan (Forest Service 2003a) or the Boise Forest Plan (Forest Service 2010a). However, Climate Change Considerations in Project Level NEPA Analysis (Forest Service 2009a) provides Forest Service guidance on how to consider climate change in project-level NEPA analysis and documentation. The following basic concepts are outlined in this document:

1. Climate change effects include the effects of agency action on global climate change and the effects of climate change on a proposed project.

2. The agency may propose projects to increase the adaptive capacity of ecosystems it manages, mitigate climate change effects on those ecosystems, or to sequester carbon.

3. It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change; therefore, determining significant effects of those projects or project alternatives on global climate change cannot be made at any scale.

4. Some project proposals may present choices based on quantifiable differences in carbon storage and GHG emissions between alternatives.

Mandatory Reporting of Greenhouse Gases Rule: As an initial action under the federal CAA, the EPA established a program in October 2009 for MRR (40 CFR 98). This program requires monitoring and annual reporting of GHG emissions for over 40 source categories if the facility’s annual emissions exceed 25,000 metric tons of GHGs (as CO₂e units). The MRR facilitates collection of emissions data to provide
a basis for future EPA policy decisions and regulatory initiatives. This federal regulation stipulates the methodology for record keeping, emission estimation, and reporting of GHG emissions.

**GHG Major Source Permitting – Tailoring Rule:** In June 2010, EPA issued a final rule (referred to as the Tailoring Rule) setting GHG emission thresholds for CAA preconstruction permits under the PSD and Title V permitting programs (75 Federal Register 31514). The Tailoring Rule established a Title V major source permitting threshold of 100,000 short tons per year for GHGs measured in CO2e. In addition, the Tailoring Rule also imposed the requirement for new major sources of GHG to implement best available control technology to reduce GHG emissions through the new source review process.

In June 2014, the Tailoring Rule provisions regarding GHG major source permitting were remanded by the U.S. Supreme Court (U.S. Supreme Court 2014). The ruling allowed EPA to continue to regulate GHG for sources already subject to regulation as PSD or Title V sources for conventional criteria pollutants.

**2016 Council on Environmental Quality Guidance:** On August 1, 2016, the CEQ issued final guidance describing how federal departments and agencies should consider the effects of GHG emissions and climate change in their NEPA reviews (81 Federal Register 51866). This guidance provided an updated approach to describe climate change impacts (CEQ 2016).

**Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, EO 13990:** This order was issued on January 20, 2021, to establish a national policy to better promote and protect public health and the environment. Additionally, CEQ will provide a separate notice of its review and potential revisions at a later date. EO 14008 also was issued on February 1, 2021, outlining a government-wide approach toward combating the “climate crisis”. Currently, the 2016 Guidance and other available resources and tools should be employed to assess GHG impacts.

**State and Local Policy:** On May 16, 2007, the Governor of Idaho signed EO 2007-05, Establishing a State Policy Regarding the Role of State Government in Reducing Greenhouse Gases (Idaho Administrative Bulletin 2007). The EO identified two types of actions to be taken: 1) the Director of the IDEQ is to take a lead role in coordinating GHG reduction efforts; and 2) the Director of IDEQ is to develop a state GHG emission inventory and develop recommendations on how to reduce GHG emissions in the state. Table 3.4-1 showing the statewide GHG emissions inventory for Idaho (by sector). GHG emission reduction strategies and/or initiatives have not yet been identified for the state.

### 3.4.4 Affected Environment

Existing conditions for climate change are discussed for the affected resources in terms of baseline GHG emissions in the analysis area, as well as potential effects from climate change on the social, physical, and biological resources in the analysis area. Additional descriptions of these conditions may be found in the SGP Climate Change Specialist Report (Forest Service 2022b).

#### 3.4.4.1 GHG Inventory Information

The GHG compounds of interest are those that would be released due to operation of diesel-fueled and gasoline-fueled engines, and propane combustion for either process needs or heating of buildings.
or release of any hydrofluorocarbons or perfluorocarbons would not be necessary for the SGP. To provide context for emissions associated with the SGP, this section also presents GHG inventory information for national and regional sources.

**National GHG Inventory Data**

Compared to 1990, annual GHG emissions in the U.S. have increased by about 1.79 percent, based on 2019 reported data (EPA 2021b). However, year-to-year emissions are shown to increase or decrease due to changes in the economy, the price of fuel, weather, and other factors.

The EPA reports that 2019 annual total emissions of CO$_2$ were 2.8 percent higher than 1990 totals, while total emissions of CH$_4$ were 15.1 percent lower, and total emissions of N$_2$O were 0.1 percent higher (EPA 2021b). GHG emissions in the U.S. were partly offset by carbon sequestration in managed forests, trees in urban areas, agricultural soils, landfilled yard trimmings, and coastal wetlands. In recent years, there has been a general nationwide trend of declining GHG emissions across most sectors (EPA 2021b).

In 2019, the latest reporting year available, transportation vehicles and electric power generation accounted for 28.6 and 25.1 percent, respectively, of U.S. emissions of GHG. Industrial sources (the reporting category that includes mining activities other than coal accounts for 22.9 percent of GHG emissions nationwide. GHG emissions from industry are mainly associated with burning fossil fuels (e.g., coal, oil, natural gas) for heat energy, as well as emissions from non-road vehicles and equipment, and manufacturing processes to produce goods from raw materials (EPA 2021b).

**GHG Inventory for Idaho**

Table 3.4-1 shows reported statewide GHG emissions within Idaho from 2018. Idaho is a relatively small contributor to U.S. GHG emissions. Based on the total data available from the EPA State Inventory and Project Tool, Idaho produced approximately 31.44 million metric tons (MMT) of CO$_2$e in 2018 (EPA 2021c). These emission estimates are based in large part from representative default values as provided by the EPA. Total national CO$_2$e emissions for 2018 was 5,870 MMT (EPA 2021b). Both yearly estimates include both sources and sinks. Idaho’s total GHG emissions accounted for less than 0.6 percent of U.S. GHG emissions during that period. The Idaho data is broken down into five general categories. These include energy consumption, industrial processes, agriculture, waste (municipal solid waste, wastewater), and land-use and forestry (sinks). Note that the total amount associated with land-use/forestry is a net reduction but included are potential emissions from forest fires. During 2020, approximately 127,214 hectares (314,352 acres) were burned from forest fires (NICC 2021). For the purposes of this analysis, it was assumed that all forest burned was temperate forest such as species like fir and pine.

The three highest contributing sectors to Idaho GHG emissions are energy (19.77 MMT), agriculture (12.64 MMT), and industrial (1.53 MMT). The overwhelming energy contributor is general fossil fuel combustion (primarily industrial and transportation petroleum usage). Mineral mining is not designated separately and is assumed to be a small overall contributor.
### Table 3.4-1 Statewide GHG Emissions Inventory for Idaho, by Sector

<table>
<thead>
<tr>
<th>Source Category</th>
<th>Fuel Type or Process Activity</th>
<th>2000 MMT CO₂e</th>
<th>2010 MMT CO₂e</th>
<th>2018 MMT CO₂e</th>
<th>2018 Sector Portion of Annual Emissions (%)</th>
<th>2000-2018 Average MMT CO₂e</th>
<th>% Change, 2000 to 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Fossil Fuel Combustion</td>
<td>17.31</td>
<td>16.70</td>
<td>19.50</td>
<td>62.01</td>
<td>17.15</td>
<td>12.64</td>
</tr>
<tr>
<td></td>
<td>Stationary Combustion</td>
<td>0.09</td>
<td>0.10</td>
<td>0.19</td>
<td>0.60</td>
<td>0.12</td>
<td>101.18</td>
</tr>
<tr>
<td></td>
<td>Mobile Combustion</td>
<td>0.27</td>
<td>0.11</td>
<td>0.08</td>
<td>0.26</td>
<td>0.14</td>
<td>-69.80</td>
</tr>
<tr>
<td></td>
<td>Subtotals of all Fuel Types</td>
<td>17.67</td>
<td>16.92</td>
<td>19.77</td>
<td>62.87</td>
<td>17.42</td>
<td>11.86</td>
</tr>
<tr>
<td>Industrial</td>
<td>Industrial Processes</td>
<td>1.42</td>
<td>1.20</td>
<td>1.53</td>
<td>4.87</td>
<td>1.38</td>
<td>7.75</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Enteric Fermentation</td>
<td>4.15</td>
<td>4.89</td>
<td>5.50</td>
<td>17.50</td>
<td>4.87</td>
<td>32.57</td>
</tr>
<tr>
<td></td>
<td>Manure Management</td>
<td>1.94</td>
<td>2.88</td>
<td>3.20</td>
<td>10.17</td>
<td>2.74</td>
<td>64.95</td>
</tr>
<tr>
<td></td>
<td>Ag Soil Management</td>
<td>3.63</td>
<td>3.59</td>
<td>3.81</td>
<td>12.11</td>
<td>3.72</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Rice Cultivation</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Liming</td>
<td>0.02</td>
<td>0.00</td>
<td>0.04</td>
<td>0.12</td>
<td>0.03</td>
<td>117.64</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
<td>0.21</td>
<td>0.10</td>
<td>-23.07</td>
</tr>
<tr>
<td></td>
<td>Burn of Ag Waste</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.09</td>
<td>0.03</td>
<td>-2.51</td>
</tr>
<tr>
<td></td>
<td>Subtotals of Ag Types</td>
<td>9.85</td>
<td>11.47</td>
<td>12.64</td>
<td>40.19</td>
<td>11.48</td>
<td>28.35</td>
</tr>
<tr>
<td>Land-use/Forestry</td>
<td>Land Use, Land Use Change, and Forestry (Sink)</td>
<td>-9.96</td>
<td>-3.42</td>
<td>-3.10</td>
<td>-9.85</td>
<td>-5.04</td>
<td>68.91</td>
</tr>
<tr>
<td>Waste</td>
<td>Municipal Solid Waste</td>
<td>0.48</td>
<td>0.52</td>
<td>0.41</td>
<td>1.30</td>
<td>0.48</td>
<td>-14.61</td>
</tr>
<tr>
<td></td>
<td>Wastewater</td>
<td>0.16</td>
<td>0.18</td>
<td>0.20</td>
<td>0.64</td>
<td>0.18</td>
<td>24.97</td>
</tr>
<tr>
<td></td>
<td>Subtotals of all Waste Types</td>
<td>0.64</td>
<td>0.70</td>
<td>0.61</td>
<td>1.94</td>
<td>0.64</td>
<td>-4.58</td>
</tr>
<tr>
<td>Grand Total</td>
<td>Sources &amp; Sinks</td>
<td>19.62</td>
<td>26.87</td>
<td>31.44</td>
<td>100</td>
<td>25.89</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: EPA 2021c

CO₂ emissions are the vast majority of fuel combustion and industrial processes (~95 percent). Agriculture GHG emissions are primarily comprised of CH₄ (~74 percent). All land use and forestry sinks are calculated as carbon sequestration (CO₂). All solid waste is CH₄ and municipal waste is also mostly CH₄ (~70 percent).

### 3.4.4.2 Climate Change Trends

Climate change is often discussed in terms of plausible futures or scenarios based on precipitation and temperature projections. These scenarios are built on different trajectories of future GHG concentrations, land use, and other factors, due to the uncertainty associated with GHG emissions and concentrations, and uncertainty in climate functions. The Intergovernmental Panel on Climate Change (IPCC) released new emission scenarios in 2013 called Representative Concentration Pathways (RCPs). RCP 8.5 represents a scenario where high emissions continue through 2100 (FHWA 2017); the discussion of emissions and climate change trends throughout this section are based on the projected scenarios under RCP 8.5.
In general, managers are recommended to use the RCP 8.5 scenario for planning and project purposes. This is based on information in the 2018 National Climate Assessment informing that without major reductions in global emissions, it is expected that the temperatures would reach RCP 8.5 levels or even higher temperatures in the future.

The IPCC Sixth Assessment Report documents evidence for the warming of the global climate system since the 1950s, based on observed changes over time periods ranging from decades to millennia (IPCC 2021). In this assessment, the IPCC reports that most land areas have seen a global surface temperature increase of 0.1°C (0.18°F) per decade since 1960, and each of the last three decades has been successively warmer than any preceding decade since 1850. In the Northern Hemisphere, 1983 to 2012 was likely the warmest 30-year period of the last 1,400 years (IPCC 2021).

As described below, the effects of climate change in the analysis area can be seen by review of reported trends in the temperature, precipitation, snowpack, and other indicators of regional climatology. Similarly, statewide climate trends also reflect the measurable effects of regional climate change that will continue to affect the environmental conditions in the analysis area regardless of the alternative implemented. These statewide and regional trends are used as a proxy to discuss current climate trends in the analysis area.

Most of Idaho has seen an increase in average temperatures of 0.56 to 1.1°C (1 to 2°F) over the last century, with the last two decades being the warmest on record (EPA 2016a). Average minimum and maximum temperatures for the middle Rockies region, which includes the Payette, Boise, Salmon-Challis, Sawtooth, and portions of the Caribou-Targhee National Forests, are projected to warm by about 5.6°C (10°F) under RCP 8.5 by 2100, with increases projected to be the largest during summer months (Halofsky et al. 2018). A recent example being the summer 2021 drought throughout much of Idaho. The projected increase in minimum temperature in this region by the year 2100 under the RCP 8.5 scenario will bring the median temperature above freezing, suggesting that a biologically meaningful threshold could be crossed (Halofsky et al. 2018). Additionally, the intensity of heat waves is projected to increase, while cold wave intensity is projected to decrease (Runkle et al. 2017).

Statewide precipitation is highly variable and showed no overall trend in annual average precipitation during the last century. However, the frequency of extreme precipitation events in Idaho has been above average over the past decade. Statewide winter and spring precipitation is expected to increase during the 21st Century, while precipitation in the summer is expected to decrease (Runkle et al. 2017). Overall, precipitation is projected to increase by 5 to 8 percent by the year 2100 under RCP 8.5 (Halofsky et al. 2018). Increased intensity of drought events is expected to occur throughout the 21st Century (Runkle et al. 2017).

Changes in river-related flood risk depends on many factors, but warming is projected to increase flood risk the most in mixed basins (those with both winter rainfall and late spring snowmelt-related runoff peaks) and remain largely unchanged in snow-dominant basins (Mote et al. 2014). Across the northwest region, much of the water supply comes from mountain snowpack, which melts in spring and summer and runs off into rivers, filling reservoirs. As the climate warms, more precipitation falls as rain and less falls as snow and more snow melts during the winter, which decreases the snowpack. Since the 1950s, Idaho’s overall snowpack has been decreasing (EPA 2016a). Lower snowpack and increased drought are likely to
lead to lower base flows, reduced soil moisture, wetland loss, riparian area reduction or loss, and more frequent and possibly severe wildfire. The projected rise in temperatures is expected to increase the average lowest elevation where the snowpack reliably accumulates throughout the winter, which may cause the tree line to shift, as subalpine fir and other high-altitude trees become able to grow at higher elevations. Rising temperatures also could result in earlier melting of the snowpack, further decreasing water availability during the dry summer months (Runkle et al. 2017).

Increasing air temperatures and decreasing summer flows associated with climate change are expected to warm streams by increasing long-wave radiation and warming groundwater inputs (Isaak et al. 2017). Reduced stream cover from changes in woody debris and bank vegetation also can result in increased stream temperatures (Halofsky et al. 2018). A transition from snow to rain, resulting in diminished snowpack and shifts in streamflow to earlier in the season, also could cause reductions in groundwater recharge to aquifers and groundwater discharge to groundwater-dependent ecosystems. Mean annual streamflow projections suggest a slight increase; however, despite these projections, summer low flows are expected to decline.

Climate controls the magnitude, duration, and frequency of weather events (e.g., wind, temperature, relative humidity, and precipitation), which, in turn, drive fire behavior (Halofsky et al. 2018). A warming climate and earlier snowmelt patterns have led to longer fire seasons, and these trends are expected to continue. The size and duration of forest fires, the length of the fire season, and size of areas burned in the West have increased over the past 30 years (Halofsky et al. 2018). The annual area burned, as well as the occurrence of very large wildfires, is projected to continue increasing as temperatures rise and longer fire seasons combine with regionally dry fuels.

3.4.4.3 Geological Resources and Geotechnical Hazards

Current climate change trends, such as increased heavy precipitation events and more precipitation falling as rain instead of snow, could lead to increased soil erosion and change in landcover, which could potentially impact slope stability and avalanche occurrence in the analysis area. Damage due to seismic activity in the area also could be exacerbated by climate-induced instability in the analysis area.

3.4.4.4 Air Quality

Climate-induced changes in weather and seasonality can strongly affect air quality in a specific region. The criteria air pollutants of most concern and potentially most affected by changes in climate, are PM, and ground-level ozone.

PM which primarily consists of sulfate and nitrate compounds, organic carbon, elemental carbon, soil dust, and sea salt. Of most concern to human health are the first four pollutants, because they are typically present as PM$_{2.5}$ and can be inhaled deep into the lungs. Seasonal variation of PM is complex and location dependent; precipitation is the main atmospheric sink for PM (Jacob and Winner 2009). An overall increase in precipitation levels may improve the cleansing of the atmosphere and may increase chemical deposition.
Hotter, drier weather can allow PM and other pollutants to accumulate in the atmosphere or allow emitted PM precursors to persist longer in the atmosphere.

The effect of climate change on PM is complicated and uncertain. As a result of climate change, more frequent and intensified wildfires could become an increasing PM source and decreases in summer precipitation could exacerbate high PM concentrations caused by wildfires (Jacob and Winner 2009).

Wildfires have the potential to cause simultaneous increases of PM$_{2.5}$ and O$_3$ within smoke plumes. (Kalasnikov et al. 2022). Summertime fires allow for more frequent co-occurrence events of the two pollutants, which can be exacerbated by increasing temperatures due to climate change.

The increase in widespread PM$_{2.5}$/ozone co-occurrences during July to September highlights the role of increasingly severe and larger wildfires which contributes to compounding public health hazards throughout the western US.

**3.4.4.5 Soils and Reclamation Cover Materials**

Reduced soil moisture is expected to result from lower snowpack due to higher variation in precipitation and increased annual average temperatures. Higher temperatures may increase the rate at which carbon stored in the soil degrades or is released by fire. More winter precipitation falling as rain instead of snow could generate a higher frequency of runoff and erosional processes from disturbance events, such as fire. Soil erosion by wind and/or water may result in loss of topsoil, which could lead to the degradation of soil quality (Halofsky et al. 2018) and negatively impact reclamation success.

**3.4.4.6 Hazardous Materials**

Although climate change would not impact the likelihood of a spill, it could potentially impact the severity of a spill. Periods of increased precipitation and flooding could have the highest impact on severity of impacts from a release of hazardous materials in proximity to a stream. High stream flows after extreme precipitation events would mean a release into surface waters could travel longer distances before being contained; however, a spill occurring during a seasonal low-flow period would travel a shorter distance, reducing the risk of spill migration.

Although extreme precipitation events occur proportionally less than low-flow periods throughout the year, climate change is expected to increase their frequency.

**3.4.4.7 Surface Water and Groundwater (Quality and Quantity)**

Streamflow, water quality, and water quantity is vital for the survival of numerous aquatic species, as well as for human use. Observations compiled from 21 USGS unregulated stream gauges across Idaho show a decrease in the cumulative water year streamflow by nearly 15 percent over the last half century (University of Idaho 2011). The magnitude of the peak streamflow is expected to increase slightly across the region; however, summer low flows are expected to decline (Halofsky et al. 2018). Additionally, the timing of peak streamflow from 1949 to 2008 has advanced about one week earlier in the spring. Advancement in the timing of peak streamflow is hypothesized to be indicative of changes in the timing of snowmelt and/or phase of precipitation (University of Idaho 2011). Spring and summer streamflow is
expected to continue to decline in basins that have historically relied on snowmelt, and low flow periods are projected to be more prolonged and severe (May et al. 2018). The decline in streamflow is expected to reduce the rate of recharge of water supply in some basins (Halofsky et al. 2018).

Because many biogeochemical processes are temperature-dependent, climate-induced changes in surface and groundwater temperature also could negatively impact the quality of these water resources (Halofsky et al. 2018).

### 3.4.4.8 Vegetation: General Vegetation Communities, Non-native Plants, and Botanical Resources

Gradual changes in the distribution and abundance of dominant plant species and short-term impacts on vegetation structure and age classes are expected as a result of rising temperatures. Increased frequency and duration of drought could impact vegetation ecosystems through changes in soil moisture, which could cause mortality or result in higher species vulnerability to insects and disease. Dominance of nonnative species may be facilitated through more frequent and intense wildfires, causing increased disturbance where native species regenerate more slowly (e.g., sagebrush species). Consequentially, the dominance of nonnative plants could themselves encourage more frequent wildfires and cause changes in the ecology of vegetation assemblages (Halofsky et al. 2018).

Whitebark pine has suffered widespread mortality throughout its range from the combined effects of mountain pine beetle outbreaks and white pine blister-rust infection. Although it is not a dominant species in the area, it is a federally proposed-threatened species and an important tree species to high-elevation ecosystems of western North America (Forest Service 2022g). Fire exclusion amplifies the climate change impacts from insects and disease by allowing succession to shade tolerant species, stressing mature whitebark pines, and limiting opportunities for seedling establishment. Projected warming and drying trends will likely further exacerbate this decline (Fryer 2002).

### 3.4.4.9 Wetlands and Riparian Resources

Changes in groundwater levels in wetlands can reduce groundwater inflow, leading to lower water table levels and altered wetland water balances. These altered water table elevations and streamflow volumes may affect riparian areas and their plant communities by reducing hydrological connectivity between uplands, wetland ecosystems and riparian areas. If water table elevation can be assumed to be in equilibrium with water levels in the stream, reduced base flows could result in lower riparian water table elevations and subsequent drying of streamside areas, particularly in wide valley bottoms. Wetland and riparian plant communities will respond to climate-induced changes in hydrological variables differently as a function of species composition (Halofsky et al. 2018).

### 3.4.4.10 Fish Resources and Habitat

Warmer air temperatures causing decreased snowpack and reduced stream flows can dramatically influence stream temperature and a host of ecosystem processes. Between 1976 and 2015 average August stream temperatures in the western U.S. showed a warming trend of 0.17°C (0.31°F) per decade. These temperatures are predicted to increase an average of 0.72°C (1.3°F) by 2040 and 1.4°C (2.6°F) by 2080.
These warmer water temperatures and lower flows are expected to impact salmon, trout, and other coldwater fish (EPA 2016a). For species dependent upon cold water, such as the federally listed Threatened bull trout, even small rises in temperature can significantly reduce spawning success (Knowles and Gumtow 1996). Additionally, increased wildfire may cause more extensive geomorphic disturbances and debris flows into streams, contributing to more variable environments and declining fluvial connectivity of aquatic habitats (Halofsky et al. 2018). Added to other stressors, such as habitat loss and fragmentation, invasive species, and disease, warmer stream temperatures could impact current spawning and rearing habitat (USFWS 2010).

3.4.4.11 Wildlife and Wildlife Habitat

The region is currently facing unprecedented rates of change in climatic conditions that may outpace the natural adaptive capacities of several native species (Halofsky et al. 2018). Increased climate variability and frequency of extreme conditions will favor species adapted to frequent disturbance, potentially increasing the abundance of invasive species. Impacts to terrestrial species as a result of climate change are already being experienced through habitat loss and fragmentation, physiological sensitivities, alterations in the timing of species life cycles (e.g., seasonal changes impacting migration, hibernation, and reproductive success), and indirect effects (e.g., disruption of species interaction across communities). Most species are expected to exhibit sensitivity to changes in the climate, especially those restricted to high elevations or surface water habitats. Of the special status wildlife species occurring in the analysis area, the flammulated owl (*Otus flammeolus*), wolverine (*Gulo gulo*), and Columbian spotted frog (*Rana luteiventris*) are expected to be the most vulnerable terrestrial populations in the region (Halofsky et al. 2018). Other special status species expected to be impacted include the Canada lynx (*Lynx canadensis*) and Rocky Mountain bighorn sheep (*Ovis canadensis*) (Halofsky et al. 2018).

3.4.4.12 Timber Resources

Forests in the interior Northwest are experiencing rapid change due to increasing wildfires and insect and disease damage, largely attributed to a changing climate (May et al. 2018). Changing climatic conditions are predicted to more than double the area in the Northwest burned by forest fires during an average year by the end of the 21st Century. An increase in wildfires would likely decrease the amount of timber available for harvests and degrade the soil, as well as threaten homes and pollute the air (EPA 2016a). The area of pine forests in the Northwest infested with mountain pine beetles is expected to increase due to climate change over the next few decades, which also could lead to decreased timber harvests (EPA 2016a).

An earlier snowmelt due to warmer temperatures can lead to greater drying of soils and vegetation, creating opportunities for earlier and larger wildfires (Westerling et al. 2006). Combined with other stressors exacerbated by climate, the rate of change in vegetation assemblages may be accelerated, reducing the productivity and carbon storage in most systems.

3.4.4.13 Land Use and Management

Long-term temperature and other climatic changes may potentially affect how lands in the analysis area are used. Climate change may impact recreational use of the land by changing the range and types of
species present through changing habitat conditions (e.g., water quality, temperatures, and streamflow), as well as accessibility for both humans and animal species to various areas through disturbance of roadways or degradation of habitat (e.g., avalanches, flooding, landslides, and wildfires).

3.4.4.14 Access and Transportation

Higher annual average temperatures, extreme weather events such as heavy rainfall and extreme heat, as well as changes in freeze/thaw patterns and snowpack dynamics, can impact roadways and other infrastructure (e.g., bridges and culverts). Roads and other infrastructure that are near or beyond their design life are at the highest risk to damage from flooding, geomorphic disturbances (e.g., landslides), and avalanches (Halofsky et al. 2018).

3.4.4.15 Heritage Resources

Some aspects of climate change may exacerbate natural damage and loss of heritage resources in the analysis area. Increasing wildfires, flooding, melting of snowfields, and erosion can uncover, displace, or destroy artifacts and other cultural or historic resources before they have been identified. Additionally, large disturbances as a result of climate change can alter the condition of vegetation, streams, and other landscape features valued by native populations (Halofsky et al. 2018).

3.4.4.16 Public Health and Safety

Impacts from climate change on public health and safety could be experienced through poor air quality from wildfires, decreased water quality from lower streamflow, more frequent extreme heat events, as well as the hazards associated with flooding or other severe weather from more frequent extreme weather events. While warmer winter temperatures may create safer and more comfortable working conditions.

3.4.4.17 Recreation

Recreational use patterns could be impacted by variable precipitation and rising temperatures, and by the change in conditions that may alter the characteristics and ecological condition of recreation settings. For example, warmer temperatures may affect individual decisions to visit a certain area, and warmer stream temperatures may affect the quantity and quality of aquatic populations for recreational fishing. Higher temperatures and decreased snowpack would affect winter activities dependent on cold temperatures and snowfall, such as skiing and snowmobiling. Other activities may benefit from longer warm and dry seasons (e.g., hiking, camping, mountain biking), but the need for supplemental resources to manage and maintain these recreational areas for a longer period of time may cause personnel and budgetary issues (Halofsky et al. 2018).

3.4.4.18 Scenic Resources

Changing climatic conditions could affect viewers experience of the landscape within the analysis area by wildfires shifting the landscape from homogenous and continuous even-aged timber stands to a mosaic of tree species and structural conditions influenced by fire.
As climate conditions change, vegetation types may experience more mortality from invasive pests, such as beetle kill, and pathogens due to further stress, temperature related or otherwise, which would impact scenery.

### 3.4.4.19 Social and Economic Conditions

Changing climatic conditions could affect the viability of local communities. Communities near the analysis area are rural and rely heavily on tourism and the trade industry to support their economies. The social and economic conditions of the area could be both negatively or positively impacted by climate-induced changes in recreational use (e.g., degraded water quality and low streamflow could decrease recreational use, but increased temperatures could create longer seasons for recreating); however, it is difficult to discern the potential magnitude of these impacts on current socioeconomic conditions. Climate change also could increase the social and economic cost of some public services, such as road repair and transportation infrastructure maintenance, as a result of increased damages caused by extreme weather events; however, the impacts of climate change on infrastructure could add trade employment to the area.

### 3.4.4.20 Environmental Justice

The tribes have specific rights to the affected land in accordance with the Nez Perce Tribe Treaty of 1855, the Fort Bridger Treaty of 1868 (Shoshone-Bannock) and the Shoshone-Paiute Executive Order of 1877. For further details please refer to the Tribal Rights and Interests Special Report (Forest Service 2022q). The tribes also use these lands as a part of their traditional use areas for activities including fishing, hunting, and gathering. The environmental justice communities could be impacted by climate change, as it may exacerbate vulnerability to health threats, economic disadvantages, and social inequity (USGCRP 2016).

### 3.4.4.21 Special Designations

Areas of special designations in the analysis area include wilderness, WSRs, IRAs, and RNAs. Although climate change would not directly impact the designations, it could potentially affect the environmental conditions within these areas. Changes in resource availability and quality, or changes to characteristics in these areas would not necessarily cause a change in designations.

### 3.4.4.22 Payette Forest Carbon Assessment

The Forest Service developed a Forest Carbon Assessment for the PNF in August 2020. The assessment indicated that the carbon storage levels have remained fairly stable with a 1.9 percent increase between 1990-2013. Additionally, negative impacts due to changes in environmental conditions have been limited and offset by forest growth (Forest Service 2020b). Satellite imagery illustrates that fire has been the most prevalent disturbance detected on the PNF since 1990, affecting about 18.2 percent of the PNF, followed by 1.4 percent by insects, 1.2 percent by harvest, and 0.1 percent by abiotic factors (Forest Service 2020b).

Climate and environmental factors, including elevated atmospheric CO₂ and nitrogen deposition, have also influenced carbon accumulation with the PNF. Recent warmer temperatures and precipitation variability may have stressed forests, causing climate to have a negative impact on carbon accumulation
in the 2000s. Conversely, increased atmospheric CO₂ and nitrogen deposition may have enhanced growth rates and helped to counteract ecosystem carbon losses due to historical disturbances, aging, and climate, for some of the forest types located on the PNF (Forest Service 2020b).

Under changing climate and environmental conditions, forests within the PNF may be increasingly vulnerable to a variety of stressors. These potentially negative effects might be balanced somewhat by the positive effects of longer growing season, greater precipitation, and elevated atmospheric CO₂ concentrations. However, it is difficult to judge how these factors and their interactions will affect future carbon dynamics on the PNF, especially with regards to large fire disturbances and increasing insect losses (Forest Service 2020b).

Forested areas on the PNF will be maintained as forest in the foreseeable future, which will allow for a continuation of carbon uptake and storage over the long term. Across the broader region, land conversion for development on private land is a concern and this activity can cause substantial carbon losses (FAOSTAT 2013; Forest Service 2016a). The PNF will continue to have an important role in maintaining the carbon sink, regionally and nationally, for decades to come.

### 3.5 Soils and Reclamation Cover Materials

#### 3.5.1 Introduction

Soils provide support for complex food webs and habitat components, and maintenance of soil quality and analyte concentrations (e.g., metals) is important for soil-hydrologic functions such as water quality, surface water retention, and groundwater recharge (Forest Service 2003a). In addition, soils salvaged prior to construction and mining activities can provide important growth materials that may be used to reclaim disturbed areas.

#### 3.5.2 Soils and Reclamation Cover Materials Area of Analysis

The analysis area for the soils and reclamation cover material resource includes the area where effects may be caused by the proposed activities (FSH.1909.15, 15.2a). The total size of the new and re-disturbed historical disturbance associated SGP is approximately 1,675 acres.

The analysis of existing soils in the effected environment is broken down into two categories, TSRC and DD. The soil analysis area under TSRC utilizes sixth-level HUC at the 12-digit scale (HUC 12) subwatershed boundaries (Figure 3.5-1). This analysis area was selected as it is a reasonable extent to which some of the potential indirect effects of the SGP might extend, such as soil erosion and sedimentation. The TSRC analysis area only includes NFS lands (management of TSRC by the Forest Service does not apply to private lands) within the sub-watersheds in which SGP components would occur. Excluded from the TSRC analysis area are IRAs, RNAs, Wilderness, and private land ownership (including private patented mining claims owned or controlled by Perpetua). HUCs used in this analysis are local subwatershed levels that encompass tributary stream systems. The soil analysis area under DD utilizes the new and upgraded transmission line corridor where activity occurs on NFS lands.
3.5.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to soil and reclamation cover material resources. Additional descriptions of these regulations can be found in the SGP Soils and Reclamation Cover Material Specialist Report (Forest Service 2022c).

**Land and Resource Management Plans:** The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired conditions for wildlife and wildlife habitat and include various objectives, guidelines, and standards related to the success of wildlife habitat in regard to soils.

**36 Code of Federal Regulations 228.8:** Mine operations on NFS lands are required by these regulations to reclaim disturbed surfaces in a timely manner, where practicable, by taking measures to prevent or control on-site and off-site damage to the environment (Requirements for environmental protection: Reclamation, 36 CFR 228.8(g)).

**Forest Service Manual (FSM) 2840:** Reclamation directs that lands disturbed by mining must be returned to a use consistent with long-term forest land and resource management plans. Plans of operations must include specific proposals to reclaim all lands disturbed by mining and address topsoil management (FSM 2840, Section 2841). Measurable performance standards are to be included for all reclamation requirements. A bond or other financial guarantee is normally required to cover the full cost of reclamation. Reclaimed areas may not always achieve the range of desired conditions described in Forest Service management direction.

**Forest Service Manual 2550:** The FSM guidelines on soil management (FSM 2550) require that NFS land be managed to maintain or improve soil quality (Forest Service 2010b). Soil quality is related to the functions that soils perform, including biodiversity, water storage, nutrient cycling, carbon storage, physical stability and support, and filtering and buffering. TSRC and DD generally result in physical, chemical and/or biological changes to soils which impair one or more of these functions. In the context of reclamation, improvement of soil quality and related soil functions should be a primary objective. Practical methods to ensure that reclamation cover materials are suitable are summarized in the guidelines.

**Idaho Administrative Procedure Act 20.03.02:** The IDL regulates surface mining in Idaho. The Mined Land Reclamation Act of 1971 and implementing regulations require that land used for surface mining is reclaimed when mining is completed, meaning the mine operation must return the land to a “productive condition” (IDAPA regulations, Section 20.03.02). The IDL has published a manual of BMPs for Mining in Idaho (1992), which provides techniques and approaches for maintaining water quality and completing reclamation projects. This manual also is referenced in the Payette Forest Plan management direction (Mineral and Geology Resources) as a guide for evaluating the completeness of reclamation plans with respect to mitigating water quality effects.
Figure 3.5-1
Total Soil Resource Commitment and Detrimental Soil Disturbance Analysis Areas
Stibnite Gold Project
Stibnite, ID

LEGEND
- PNF Sub-Watersheds
- BNF Sub-Watersheds
- Other Sub-Watershed
- DD Analysis Area
- TSRC Activity Area
- IRA and Forest Plan Special Area
- Patented Claims
- Other Features
  - U.S. Forest Service
  - Wilderness
  - Highway
  - Road
  - Lake/Reservoir

Note:
The McCall – Stibnite Road (CR 50-412) consists of
Lick Creek Road, East Fork South Fork Salmon
Road (East Fork Road) and Stibnite Road.

Base Layer: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Other Data Sources: Midas Gold; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

Mile = 4 miles
when printed 11x17
3.5.4 Affected Environment

3.5.4.1 Soil Landscapes

The analysis area is in the Stibnite Mining District, with prospecting dating back to the late 1800s. Mining began in the 1920s and continued intermittently through 1997. This historical use of the area has resulted in a wide variety of soils modified by human activity throughout the SGP and vicinity, with approximately 522 acres at the SGP considered highly disturbed (Tetra Tech 2017).

Soil at the SGP is generally characterized as weakly developed and coarse textured with a high prevalence of coarse fragments, formed in semi-humid, sub-alpine environments. The dominant parent materials are residual and colluvial material sourced from two main bedrock types: Paleozoic metamorphic rock and younger igneous intrusive rock of the Cretaceous Idaho Batholith. Igneous intrusive rock is much more prevalent in the SGP area. Metasediments (generally quartzite and marble) are primarily found in the vicinity of the West End pit and in lesser amounts near the proposed mill site and southeastern end of the former Yellow Pine open pit. Additional areas of metasediment exposure occur near the proposed mine cap facilities. Bedrock depths are typically deep in alluvial valley bottoms and on side slopes that have a mantle of glacial till, outwash, or colluvium. Very steep, glaciated valley walls typically have bedrock at the surface or at shallow depths. Surface cobbles, stones, and boulders also are locally prevalent, along with bedrock outcrops. While most common on very steep slopes, very stony surfaces also cover approximately 81 acres (5 percent) of the area within the Operations Area Boundary with slopes less than 45 percent (Tetra Tech 2017).

In the analysis area, thin, poorly developed surface and subsurface layers (A, AC and C horizons) have formed on steep slopes (30 to 80 percent gradient) where surface creep is evident by the J-shaped trees. This soil has been interpreted to be generally stable unless it is disturbed or has its vegetative cover removed (Forest Service 1981, 1994). Approximately 366 acres, or 22 percent, of the Operations Area Boundary is considered to have very steep slopes (greater than 45 percent) (Tetra Tech 2020a).

Soil development and thickness of A, AC, and C horizons is strongly correlated with slope position. In general, upper side slopes and ridge tops (runoff or convex positions) experience more erosion and have weaker soil development and shallower soils. Lower side slopes, foot slopes, and toe slopes (concave positions) experience more deposition and have deeper soil development. Mid-slopes or backslopes (transitional areas) experience both erosion and deposition and have intermediate soil development. However, with the exception of the wetland soils located in the SGP survey area, there is little variability in the extent of pedogenesis or thickness of the A and AC horizons (TetraTech 2017 and 2020a). The generalized description of soil development on ridge tops was not assessed by the SGP surveys.
3.5.4.2 Soil Types

Soils in the SGP area are generally young, poorly developed, and often occur on steep slopes. This means their physical and chemical characteristics are often closely associated with the underlying parent materials. Three basic types of parent materials are present and include residuum and colluvium developed in bedrock, alpine glacial till, and alluvium.

The geomorphic setting of the SGP area has resulted in a very complex pattern of soils across the landscape, depending on the presence/absence and depth of the glacial till, colluvium, alluvium, and the composition of the bedrock. The disturbance history also has added another layer of complexity. Pronounced changes in soil properties may occur across short distances. The details of this variability are documented in the Soil Hydrologic Reconnaissance Reports (Forest Service 1974a, 1972, 1969) and the surface soil texture maps developed for the Soil Resources Baseline Study (Midas Gold 2017b).

A map of soil salvage area and depths by soil map unit at the Operation Area Boundary is provided on Figure 3.5-2. Maps of dominant soil types in the mine area and along the proposed new sections of the Burntlog Route are provided in the SGP Soils and Reclamation Cover Materials Specialist Report (Forest Service 2022c). A summary description of mapped soil types and the extent mapped at the SGP is provided in Table 3.5-1 and detailed mapping of the soil map units is available in the SGP Soils and Reclamation Cover Materials Specialist Report (Forest Service 2022c).

Suitable soils are further rated as either good, fair, or poor for reclamation in Table 3.5-2. Sustainable revegetation success depends on the quality of growth media and subjacent material that comprises the vegetation root zone with regard to a number of physical, chemical, and nutrient factors. A root zone analysis based on existing site conditions was utilized to develop suitability criteria for growth media and root zone material (Tetra Tech 2020a) and included characterization of metal concentrations in site soils.

Sustainable revegetation success depends on the quality of growth media and subjacent material that comprises the vegetation root zone with regard to a number of physical, chemical, and nutrient factors. A root zone analysis based on existing site conditions was utilized to develop suitability criteria for growth media and root zone material (Tetra Tech 2020a) and included characterization of metal concentrations in site soils. Suitable soils rated as good generally have loamy soil textures, few coarse fragments, slightly acidic to slightly alkaline pH, and occur on level to gently sloping ground. Unsuitable soils have either very high coarse fragment content; are extremely acidic or very strongly alkaline; or occur on very steep slopes. Soils with a high proportion of surface stones, and soils disturbed by legacy mining activities also are considered unsuitable for reclamation.
Figure 3.5-2
Soil Salvage Area and Depths by Soil Map Unit
Stibnite Gold Project
Stibnite, ID

Recommended Growth Media and Seedbank Materials Salvage Depths by Soil Map Unit

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Soil Map Unit (w/ description or limitation)</th>
<th>Depth Below Ground Surface (ft)</th>
<th>Estimated Percent of Map Unit Available for GM/SBM</th>
<th>Recommended Growth Media and Seedbank Material Salvage Depth by Soil Map Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>mOD</td>
<td>(stream floodplains)</td>
<td>0-2.2</td>
<td>90%</td>
<td>SBM</td>
</tr>
<tr>
<td>cTH</td>
<td>(wetlands)</td>
<td>0-2.08</td>
<td>90%</td>
<td>SBM</td>
</tr>
<tr>
<td>mTC</td>
<td>(uplands)</td>
<td>0.0-0.5</td>
<td>90%</td>
<td>GM</td>
</tr>
<tr>
<td>s45+</td>
<td>(slopes &gt;45% w/RO)</td>
<td>1.42</td>
<td>90%</td>
<td>GM</td>
</tr>
<tr>
<td>sTC</td>
<td>(excessive Rock)</td>
<td>0-1.0</td>
<td>90%</td>
<td>GM</td>
</tr>
<tr>
<td>AoD+</td>
<td>(areas of previous disturbance w/GM salvage potential)</td>
<td>0-1.0</td>
<td>90%</td>
<td>GM</td>
</tr>
<tr>
<td>AoD</td>
<td>(areas of previous disturbance )</td>
<td>0-0.00</td>
<td>90%</td>
<td>No Applicable</td>
</tr>
<tr>
<td>bTC</td>
<td>(excessive boulders)</td>
<td>0-0.00</td>
<td>90%</td>
<td>No Applicable</td>
</tr>
<tr>
<td>mCP</td>
<td>streams</td>
<td>0-0.00</td>
<td>90%</td>
<td>No Applicable</td>
</tr>
</tbody>
</table>

Base Layer: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Other Data Sources: State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

LEGEND
- 2017
- 2019
- Soil Survey Boundary
- Soil Map Unit
  - mOD (stream floodplains)
  - cTH (wetlands)
  - mTC (uplands)
  - s45+ (slopes >45% w/RO)
  - sTC (excessive Rock)
  - AoD+ (areas of previous disturbance w/GM salvage potential)
  - AoD (areas of previous disturbance)
  - bTC (excessive boulders)
  - mCP streams

0 1,750 3,500 Feet
0 1 inch = 3,500 feet
when printed at 11x17

Spatial Data: Source: Esri, OpenStreetMap Geographics, and the GIS User Community
Other Data Sources: Boise National Forest, Payette National Forest, Atlas of Idaho

### Table 3.5-1  Dominant Soil Types in the SGP

<table>
<thead>
<tr>
<th>Map Unit</th>
<th>Soil Description¹</th>
<th>Dominant Soil Suborder</th>
<th>Particle Size Class²</th>
<th>Solum Thickness³ (inches)</th>
<th>Minimum Depth to Extremely Cobbly or Gravelly Material (inches)⁴</th>
<th>Extent Mapped (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mTC</td>
<td>A Orthents</td>
<td>Sandy/Loamy-Skeletal</td>
<td>17</td>
<td>34</td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>sTC</td>
<td>A Orthents (stony)</td>
<td>Sandy/Loamy-Skeletal</td>
<td>12</td>
<td>0</td>
<td></td>
<td>1,136</td>
</tr>
<tr>
<td>bTC</td>
<td>A Orthents</td>
<td>Loamy-Skeletal</td>
<td>0</td>
<td>N/A⁵</td>
<td></td>
<td>206</td>
</tr>
<tr>
<td>S45+</td>
<td>A Orthents (very steep)</td>
<td>Sandy/Loamy-Skeletal</td>
<td>12</td>
<td>0</td>
<td></td>
<td>1,876</td>
</tr>
<tr>
<td>mOD</td>
<td>A Cryepts</td>
<td>Coarse-Silty</td>
<td>6 or 24 by location</td>
<td>N/A⁵</td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>cTH</td>
<td>A Saprist</td>
<td></td>
<td>11 or 25 by location</td>
<td>N/A⁵</td>
<td></td>
<td>89</td>
</tr>
<tr>
<td>mCP</td>
<td>A Psamment</td>
<td>Sandy-Skeletal</td>
<td>28</td>
<td>N/A⁵</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>AoD</td>
<td>B N/A</td>
<td>N/A</td>
<td>12</td>
<td>N/A</td>
<td></td>
<td>621</td>
</tr>
<tr>
<td>AoD+</td>
<td>B N/A</td>
<td>Sandy-Skeletal</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Streams</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4,214</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Midas Gold 2017b; Tetra Tech 2017, 2019a, 2020a; NRCS 1999

¹A Somewhat excessively and excessively drained soils developed in residuum and colluvium derived from igneous intrusive rock. ¹B Areas of Previous Disturbance – No Salvageable Soil.

N/A = not applicable

² Skeletal classes have >35 percent (%) coarse fragments. Sandy = loamy sand or sand textures. Loamy = generally loam, sandy loam, and silt loam textures with <35% clay. Coarse-Silty has <35% coarse fragments, <15% fine sand or coarser, and <18% clay.

³ The solum includes all soil layers that have undergone soil forming processes, including the O, A, and AC horizons (Tetra Tech 2017, 2020a). It excludes the C horizon.

⁴ Estimated at >60% coarse fragments by volume.

⁵ Depth not reached to hit >60% coarse fragments by volume.
### Table 3.5-2  Reclamation Cover Materials Suitability Ratings for SGP Soils

<table>
<thead>
<tr>
<th>Soil Map Unit (Depth in inches)</th>
<th>Suitability Rating</th>
<th>Limiting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>fOD (0-12)</td>
<td>Fair</td>
<td>pH 5.3 to 5.9</td>
</tr>
<tr>
<td>fOD (12-30)</td>
<td>Fair</td>
<td>Coarse fragments 15-30%</td>
</tr>
<tr>
<td>fTH (0-12)</td>
<td>Good</td>
<td>None - organic soils</td>
</tr>
<tr>
<td>fTH (12-36)</td>
<td>Good</td>
<td>None - organic soils</td>
</tr>
<tr>
<td>mTC (0-6)</td>
<td>Fair on slopes &lt;25%</td>
<td>Coarse fragments 15-30%; pH 5-6</td>
</tr>
<tr>
<td>mTC (0-6)</td>
<td>Poor</td>
<td>Coarse fragments near 60%</td>
</tr>
<tr>
<td>mTC (6-18)</td>
<td>Poor</td>
<td>pH 4.9 to 5.1</td>
</tr>
<tr>
<td>S45+ (all)</td>
<td>Poor</td>
<td>Slope &gt;45%</td>
</tr>
<tr>
<td>sTC (all)</td>
<td>Poor</td>
<td>Surface stones, boulders, and rock outcrop</td>
</tr>
<tr>
<td>AoD (all)</td>
<td>Unsuitable</td>
<td>Non-soil material related to legacy mining</td>
</tr>
<tr>
<td>bTC (0-13)</td>
<td>Unsuitable</td>
<td>Excessive boulders</td>
</tr>
<tr>
<td>AoD+ (all)</td>
<td>Fair</td>
<td>High content of coarse fragment (60%), pH 5.0 to 5.6, slope average 37%</td>
</tr>
<tr>
<td>cTH (all)</td>
<td>Fair</td>
<td>High content of coarse fragments (21%)</td>
</tr>
<tr>
<td>mCP</td>
<td>Unsuitable</td>
<td>High content of coarse fragment</td>
</tr>
<tr>
<td>streams</td>
<td>Unsuitable</td>
<td>Limited soils, rock dominated</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Midas Gold 2017b; Tetra Tech 2017, 2019a, 2020a
Suitability Rating based on growth media suitability criteria (TetraTech 2020a) and soil data (TetraTech 2017, 2020a).

**Suitable Soil Types for Reclamation**

Soil map unit number fOD is coarse-silty, mixed, frigid oyaquic dystrocryepts (fOD) formed in alluvium in drainage bottoms near stream channels. This unit is similar to the mOD unit described below but is typically found along the Burntlog Route instead of the mine area. These soils are very deep (>60 inches). This soil has varying mean seasonal temperatures, is saturated but may not be hydric, and typically supports evergreen tree growth in alpine and subalpine communities. Depth to water is between 12 and 24 inches and fluctuates seasonally as indicated by redoximorphic soil features observed in the soil profile. Texture of these soils is silt, loam, silt loam, sandy loam, and loamy sand. Generally, these soils have high organic matter content in the upper soil layers and are suitable as sources for salvage assuming groundwater elevations are reduced. An average depth of 30 inches is available for soil borrow in this map unit.

Soils from map unit fTH are euic, frigid typic haplosaprist (fTH) meaning these soils lack definitive horizons, have elevated pH, and have varying mean seasonal temperatures. This unit is similar to the cTH unit described below but is typically found along the Burntlog Route instead of the mine area. These soil types were observed on side slopes adjacent to the fOD soils. These soils develop by the accumulation and subsequent decomposition of organic matter in forested settings and lack the mineral soil layers and sandy textures found in the fOD soils. These soils are high in organic matter, occur on shallow to
moderate slopes resulting from seeps, and are suitable as salvage material. An average depth of 36 inches is available for soil borrow in this map unit.

Soil pedons described in the sandy-skeletal/loamy-skeletal, mixed typic cryorthents (mTC) are classified as either sandy-skeletal or loamy-skeletal and are derived from slope colluvium or residuum. These soils have a fine loamy texture, typically have above-freezing temperatures, and occur on steep slopes. Soils in this map unit were typically explored to 20 inches or less because of the high percentages of coarse fragments increasing with depth. Geotechnical investigations indicate these soils are very deep with surficial material varying in thickness from a few to over 40 feet (SRK 2012). Thin A horizons transitioning to C horizons are common in this map unit. No evidence of subsurface soil horizon development as required to identify a B horizon was observed. An average depth of 17 inches is available for soil borrow in this map unit.

Soils from map unit sTC are stony typic cryorthents (sTC), formed in colluvium and alluvium which were derived from glacial deposits. These soils are composed of gravels, stones, and cobbles that form on slopes that range from a 10 to 45 percent grade (Tetra Tech 2020a). The soils in this soil map unit (SMU) located within the primary zone of mineralization at the SGP have elevated antimony and arsenic concentrations compared with soils in this same SMU located outside the primary zone of mineralization (Tetra Tech 2021a). A horizons transitioning to AC horizons, then to C horizons are common in this map unit. There are burn areas present in the SMU. An average depth of 12 inches is available for soil borrow in this map unit (Tetra Tech 2020a).

Soils composing the S45+ SMU are typic cryorthents (88 percent of SMU), forming on slopes that are 45 percent and greater. Rock outcrops, predominantly granodiorite with some granite, tend to occur at the higher elevations in this SMU (12 percent of SMU). The soils of this SMU are formed from glacial deposits and weathered granodiorite residuum with a high percent of rock fragments (Tetra Tech 2020a). The soils in this SMU have elevated antimony, arsenic, and mercury concentrations (Tetra Tech 2021a). There are burn areas present in the SMU. Thin A horizons transitioning to AC and C horizons are typical of this SMU. An average depth of 12 inches is available for soil borrow in this map unit (Tetra Tech 2020a).

Soil map unit number mOD is an inceptisol, meaning that the soils form in cold regions and have moderately high silt and clay content. SMU mOD is an oxyaquic dystrochrept that forms near floodplains near stream channels in alluvium. The soils in this SMU run deep, with depth to water being shallow (12 to 24 inches below ground surface). The groundwater likely fluctuates seasonally as expressed by the redoxomorphic features in the soils. The soil characteristics consist of silt to sand textures, generally having a high organic matter content in the upper horizons, until the C horizon is reached, and the soils transition to sand (Tetra Tech 2020a). The soils in this SMU have elevated antimony, arsenic, and mercury concentrations (Tetra Tech 2021a). An average depth of 30 inches is available for soil borrow in this map unit (Tetra Tech 2020a).

Soils from the SMU typic halosparists (cTH), are histosols, meaning that the soils were saturated and heavily composed of organic matter. This is typical of the wetland area which these soils formed. These soils were observed in seeps, toe slopes, and depressions. Standing water was present throughout the SMU, indicating that the water table likely has seasonal fluctuations. These soils occur on shallow-to-
moderate slope faces and tend to lack fluvial depositional patterns, horizonation, and sandy textures. The soils in this SMU are high in calcium, magnesium, potassium, total organic carbon, calcium carbonate, and organic matter in the upper horizons when compared to the other SMUs (Tetra Tech 2020a). The soils in this SMU also have elevated antimony, arsenic, and mercury concentrations (Tetra Tech 2021a). An average depth of 36 inches is available for soil borrow in this map unit (Tetra Tech 2020a).

Areas of previous disturbance (AoD) with GM salvage potential (AoD+) is a map unit that is comprised of land that has been historically disturbed by mining activities, which has since been reclaimed. The majority of the soil remains intact, and the quality and quantity of the soil in this SMU has not been negatively affected by historical mining; therefore, has an average depth of 12 inches of soil that is considered salvageable (Tetra Tech 2020a). The soils in this SMU also have elevated antimony, arsenic, and mercury concentrations (Tetra Tech 2021a).

**Unsuitable Soil Types for Reclamation**

AoDs occur on previous mining activities and include spent heap leach ore storage areas, deposited tailings, development rock dumps, and open pits. These materials are deemed unsuitable for salvage.

Boulder Typic Cryorthents (bTC) is composed of large boulders, talus, and scree material. This SMU occurs on forested areas with burn areas present. These materials are deemed unsuitable for salvage due to the grain size (Tetra Tech 2020a).

The typic cryopsamments (mCP) soil unit consists of rounded gravels, cobbles, and stones. The soils are from fluvial deposits which resulted from the Blowout Creek (i.e., EFMC) dam failure. The slopes of this SMU are less than 10 percent, and soils consist of layered sand deposits, varying in thickness.

The streams SMU are composed of stream beds and stream corridors. This soil unit is dominated by rock fragments and generally is lacking in soil.

The suitability criteria in Table 3.5-2 are applied to the SGP map units in Table 3.5-1.

### 3.5.4.3 Operation Area Boundary

Baseline soil and surface characterization is provided below for the six broad areas of potential disturbance from the Soil Resources Baseline Study (Midas Gold 2017b) that generally correspond to the various SGP areas (i.e., Meadow Creek, Fiddle Creek, Hangar Flats, Yellow Pine, West End, and Infrastructure Areas; see Figure 3.5-2).

**Meadow Creek Area**

This area includes the Meadow Creek valley floor, lower side slopes, and the surrounding valley walls. The Meadow Creek valley floor has deep to very deep, loamy-skeletal, sandy-skeletal, coarse-loamy, and coarse-silty soils developed in alluvium, slope wash, and glacial outwash deposits (map units fOD, mTC). Approximately 54 acres of soils are slightly to strongly acid and have a moderate to high amount of organic matter and generally low levels of essential plant nutrients. Deep alluvial soils cover approximately 32 acres. A seasonal high-water table and soil saturation is present in much of this area.
(Midas Gold 2017b). The glaciated valley walls have weakly developed, loamy-skeletal and sandy-skeletal soils developed in residuum and colluvium derived from weathered granitic bedrock (map units mTc, S45+). Approximately 12 percent of these soils have a high percentage of surface coarse fragments and rock outcrops (sTC) (Midas Gold 2017b; Tetra Tech 2017).

Areas of legacy mining disturbance in the lower Meadow Creek area include the Spent Ore Disposal Area, stream diversions, roads, and vehicle trails. Fifty-six acres, or 10 percent of the area, was mapped as disturbed (AoD) (Tetra Tech 2017). High soil compaction was identified in these areas. Natural disturbance in the Meadow Creek area includes historical wildfires and past landslides and avalanches. Soil disturbance classes identified in burned areas were generally class 0 (none) or 1 (low), and legacy mining disturbance zones were class 2 (moderate) or 3 (severe) (Midas Gold 2017b). Soil disturbance classes are defined in the Forest Soil Disturbance Monitoring Protocol (Forest Service 2009b). Although wildfires are not considered part of the Forest Soil Disturbance Monitoring Protocol, impacts on the soil are recorded.

**Fiddle Creek Area**

The main Fiddle Creek drainage encompasses the lower part of a glacially scoured (cirque) basin and glacial trough walls. The narrow valley floor has coarse-loamy and coarse-silty soils (fOD) developed in alluvium along the stream channel covering approximately 10 acres. The cirque basin and glaciated valley walls have predominantly sandy-skeletal and loamy-skeletal soils (mTC, S45+) developed in colluvium and residuum from granitic bedrock. Rock outcrop and areas of high surface stoniness occur over approximately 5 percent of the area with slopes less than 45 percent. Approximately 4 acres of organic soils (fTH) occur in seepage zones above Fiddle Creek (Midas Gold 2017b).

Four sample locations were investigated in the upper Fiddle Creek area, both receiving laboratory analysis (Tetra Tech 2017, 2021a). Mineral soil textures were found to be predominantly sandy loam and very gravelly loamy sand. The soils are slightly to strongly acid, have a high content of organic matter in the surface (greater than 4 percent), and generally have low to very low levels of essential plant nutrients. Soil saturation was identified in only a few areas in the valley bottom.

Mapped legacy mining disturbance is minimal. One acre was mapped as disturbed (AoD). Former drill roads and drill pads are largely reclaimed. Areas of natural disturbance include both historical wildfires and former landslides and avalanches. Disturbance classes identified in burned areas were class 0 (none) or 1 (low) (Midas Gold 2017b).

**Hangar Flats Area**

This area contains predominantly steep, glaciated side slopes and a portion of the Meadow Creek valley floor. Ninety-six samples were collected in Hangar Flats area, with seven samples receiving laboratory analysis (Midas Gold 2017b; Tetra Tech 2017). The soils are slightly to strongly acidic, have a moderate to high amount of organic matter in the surface, and generally have low to very low levels of essential plant nutrients. The steep glacial trough walls have weakly developed, sandy-skeletal and loamy-skeletal soils (mTC, S45+) developed in residuum and colluvium from granitic bedrock. The valley floor contains large AoDs from drilling and mining activities. Native soils are deep to very deep, coarse-loamy, coarse-
silty, and loamy-skeletal soils developed in alluvium, glacial outwash, and slope wash. Deep alluvial soils (fOD) cover approximately 13 acres. There is a high percentage of histosols (fTH) in seepage zones totaling approximately 23 acres. A seasonal high-water table is present over much of the valley floor and toe-slopes (Midas Gold 2017b).

Areas of legacy mining disturbance include a SODA, Bradley tailings, smelter, mill site, historical creek diversions, private access roads on the hillside, and partially reclaimed zones on the valley floor from past drilling and mining and associated activities. Forty-two acres, or 35 percent of the area, was mapped as disturbed (AoD) (Tetra Tech 2017). High soil compaction was identified in these areas by the Soil Resources Baseline Study. Natural disturbance in the Hangar Flats area includes historical wildfires and past landslides and avalanches. Soil disturbance classes identified in burned areas were generally class 0 (none) or 1 (low), whereas legacy mining disturbance zones were class 2 (moderate) or 3 (severe) (Midas Gold 2017b).

**Yellow Pine Area**

Yellow Pine area contains predominantly steep, dissected mountain slopes on the east side, glaciated valley wall on the west side, and the East Fork SFSR valley floor in between. Soil conditions were investigated at 75 locations in this area, with five samples receiving laboratory analysis (Midas Gold 2017b; Tetra Tech 2017, 2021a). The soils are slightly to moderately acidic, have a moderate amount of organic matter, and generally have low to very low levels of essential plant nutrients. The steep east- and west-facing slopes have weakly developed, loamy-skeletal and sandy-skeletal soils (mTC, S45+) developed in residuum and colluvium from granitic bedrock. The valley floor is mostly disturbed (AoD) by previous mining activities. Undisturbed soils are deep to very deep, loamy-skeletal, sandy-skeletal, and coarse-loamy soils (fOD, mTC) developed in alluvium and slope wash. Deep alluvial soils cover approximately 10 acres. Histosols (fTH) cover approximately 8 acres. A seasonal high-water table is present adjacent to stream courses.

Legacy mining activity in this area is extensive and includes the historic Yellow Pine pit/lake and associated mine benches, waste rock dump, old drill and mine access roads, building sites, and underground portals. Recontouring has occurred in the reclaimed Homestake area (i.e., the northeast portions of the Yellow Pine area). Forty acres, or 20 percent of the area, was mapped as disturbed (AoD) (Tetra Tech 2017). Thirty-six percent of the Yellow Pine area has slopes greater than 45 percent (S45+), a large portion of which also are disturbed. Evidence of wildfire was present in the southwest portion of this area. Disturbance classes identified in burned areas were generally low (Midas Gold 2017b).

**West End Area**

This area is characterized by steep, dissected mountain slopes. Midnight Creek and West End Creek flow through the area and have created sharply incised channels. Much of this area has been disturbed by legacy mine operations (AoD).

Undisturbed soils are predominantly sandy-skeletal and loamy-skeletal (S45+) developed in colluvium and residuum from metasedimentary rocks (predominantly quartzite). Deep alluvial soils (fOD) cover approximately 10 acres. Sixty-one sample locations were recorded in this area, with five samples
receiving laboratory analysis (Midas Gold 2017b; Tetra Tech 2017, 2021a). Surface soil textures in undisturbed areas were predominantly very gravelly loamy sand, loamy sand, sandy loam, and loam. The soils are slightly to strongly acidic, have a moderate to high amount of organic matter, and generally have low to very low levels of essential plant nutrients.

Legacy mining activity in this area is extensive and includes multiple mining pits, haul roads, access roads, waste rock dumps, and areas of deep backfill. Surface materials are bare rock or backfill. Twenty-three acres, or 8 percent of the area, was mapped as disturbed (AoD) (Tetra Tech 2017). Eighty-four percent of the West End area has slopes greater than 45 percent (S45+), a large proportion of which also are disturbed. There was no evidence of wildfire in this area.

**Infrastructure Areas**

These areas are predominantly within the East Fork SFSR valley floor and adjacent fan terraces and lower side slopes. Most of these areas have been previously disturbed (AoD) by mining activities. The SGP facilities that the Infrastructure Areas include: the Crusher ROM Stockpile, Scout Rom Stockpile, Mill, Water Treatment Plant, Water Treatment Plant Laydown, Truck Shop, Main Gate, Main Gate GMS, and the worker housing facility.

One hundred and sixteen (116) sample locations were established in undisturbed soil areas, with 6 samples receiving laboratory analysis (Midas Gold 2017b, Tetra Tech 2021a). Surface soil textures were predominantly fine sandy-loam with a high portion of coarse fragments (sTC) developed in alluvium and colluvium from glacial deposits (Tetra Tech 2020a). Deep alluvial soils cover approximately 6 acres, primarily along haul road routes. Organic soils (fTH) cover approximately 5 acres and were observed in poorly drained areas near seeps and streams with saturation identified in a few (Midas Gold 2017b). The soils are slightly to strongly acidic, have a low to moderate amount of organic matter, and generally have low to very low levels of essential plant nutrients (Midas Gold 2017b).

Areas of existing disturbance include historic town sites, reclaimed haul roads, and mine access and infrastructure areas that show high soil compaction, as well as current roads, parking lots, laydown areas, and camp buildings. Thirty-two acres, or 12 percent of the areas, were mapped as disturbed (AoD) (Tetra Tech 2017). Areas of natural disturbance also exist, caused by both historical wildfires and landslides and avalanches. Disturbance classes identified in burned areas were generally class 1 (low) to class 0 (none), whereas areas disturbed by past mining were class 3 (severe) or class 2 (moderate) (Midas Gold 2017b).

**3.5.4.4 Access Roads**

Geology and geomorphic features of the Burntlog Route were investigated, and the bedrock geology and geomorphology were found to be very similar to those described for the Operations Area Boundary. Granitic bedrock underlies most of the route, with a few inclusions of volcanic and metasedimentary rock (Midas Gold 2017c). The area has been glaciated, creating narrow u-shaped valleys with steep sides and flat valley bottoms. The route is characterized by weakly developed, loamy-skeletal and sandy-skeletal soils (mTC, S45+) developed in residuum and colluvium from granitic bedrock. Deep alluvial soils (fOD) and histosols (fTH) make up approximately 8 percent of the route, occurring in drainageways and slope
seepage zones. It is estimated that 40 percent of the mTC soil map unit would be practically salvageable using heavy equipment (Tetra Tech 2019a).

### 3.5.4.5 Utilities

No soils field investigations occurred for the existing or proposed transmission line ROW. The corridor crosses through 35 different land types on NFS lands. Mapping is available in the Soil Hydrologic Reconnaissance Reports (Forest Service 1969, 1972, 1974a). The Forest Service surveys describe relatively young soils with coarse textures and weak horizon development that are influenced by fluvial cycles. Landform strongly influences soil development as slopes generally have areas of soil loss, equal soil loss-gain, and material accumulation. Deeper soils are located in areas of material accumulation above concave landforms such as swales.

### 3.5.4.6 Off-site Facilities

Locations of off-site facilities include the Landmark or Burntlog Maintenance Facility (depending on which alternative is selected) and the SGLF. The Landmark Maintenance Facility would be constructed on a previously disturbed borrow site. The soils are mapped as mTC ([Table 3.5-1](#)) (Tetra Tech 2017). The Burntlog Maintenance Facility would be located in one of the access roads borrow source locations (4.4 miles east of the junction of Johnson Creek Road and Warm Lake Road along the Burntlog Route). The SGLF would be constructed on an alluvial fan terrace above Big Creek. Soils are mapped as Donnel sandy loam, 2 to 4 percent slopes (NRCS 2017). These are well drained soils formed in alluvium weathered from granite. They have sandy loam textures in the solum, over stratified loamy sand and sandy loam starting below 20 inches. A seasonal water table is greater than 80 inches below the ground surface. Minor inclusions in the map unit include poorly drained soils in the floodplain. The SGLF would be located on private land.

### 3.5.4.7 Soil Contamination/Chemistry

The Operations Area Boundary occurs in an area containing numerous highly mineralized zones, and natural background concentrations of some metals are known to be relatively high in some soils and regolith (i.e., the unconsolidated material below the soil profile and on top of bedrock). In addition, elevated levels of arsenic, antimony, and mercury have been observed in soils contaminated by legacy mine operations (URS 2000a). Some known locations of contamination were previously remediated, but it is possible that additional areas of contamination would be exposed during SGP-related construction, operations, and closure and reclamation. Perpetua evaluated 4,828 exploration soil samples collected from undisturbed areas adjacent to the SGP from 2009 to 2015. The mean concentrations of antimony (14.88 ppm within a range of 0.04 to 2,580 ppm) and mercury (0.972 ppm within a range of 0.005 to 283 ppm) from the samples are high but are still within the highest screening-level phytotoxicity criteria concentrations from various literature references and federal agencies in U.S. and Canada cited in the Reclamation and Closure Plan (Tetra Tech 2021a). The samples were not analyzed using EPA-approved methodologies for environmental analysis. Samples were analyzed using exploration lab methodologies that have more aggressive extraction methods (resulting in potentially higher concentration outputs), which are not typically compared to these environmental screening levels. The mean concentration of arsenic (115 ppm) from the samples is approximately 6.4 times higher than the EPA’s ecological soil
screening level for arsenic (Tetra Tech 2021a). A principal concern regarding the re-use of soil and rock at the SGP is the high metals concentrations that may remain and complicate revegetation plans for reclaimed areas. Total arsenic was identified as having the greatest potential for phytotoxicity in plants growing on reclaimed and legacy mine lands in the Operations Area Boundary.

3.5.4.8 Existing Total Soil Resource Commitment

TSRC is the conversion of a productive site to an essentially non-productive site for a period of more than 50 years. Mining excavations and dumps, roads, dedicated trails, parking lots, and other dedicated facilities (e.g., landfills, borrow sites, surface water management features, etc.) are examples of TSRC. The activity area for TSRC on NFS lands is shown on Figure 3.5-1.

Existing TSRC within the 16 subwatersheds encompassing where disturbance associated with the SGP would occur (Table 3.5-3) was mapped with the use of a geographic information system (ArcGIS) with relevant digital spatial layers including Lidar-generated terrain maps, aerial photographs, road and trail layers, and previous mapping of disturbed areas.

Table 3.5-3 Analysis Area Subwatersheds, Activity Area, and Existing TSRC

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Subwatershed (acres)</th>
<th>Activity Area (acres)</th>
<th>Existing TSRC in Activity Area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNF Subwatersheds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headwaters East Fork SFSR</td>
<td>15,974</td>
<td>5,034</td>
<td>171</td>
</tr>
<tr>
<td>Sugar Creek</td>
<td>11,497</td>
<td>2,021</td>
<td>57</td>
</tr>
<tr>
<td>No Man’s Creek-East Fork SFSR1 (PNF)</td>
<td>17,885</td>
<td>413</td>
<td>31</td>
</tr>
<tr>
<td>BNF Subwatersheds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Man’s Creek-East Fork SFSR1 (BNF)</td>
<td>1,837</td>
<td>516</td>
<td>11</td>
</tr>
<tr>
<td>Porcupine Creek-Johnson Creek</td>
<td>21,516</td>
<td>2,796</td>
<td>78</td>
</tr>
<tr>
<td>Riordan Creek</td>
<td>14,411</td>
<td>883</td>
<td>17</td>
</tr>
<tr>
<td>Trapper Creek-Johnson Creek</td>
<td>12,129</td>
<td>2,518</td>
<td>37</td>
</tr>
<tr>
<td>Ditch Creek-Johnson Creek</td>
<td>16,222</td>
<td>3,628</td>
<td>48</td>
</tr>
<tr>
<td>Burntlog Creek</td>
<td>25,194</td>
<td>9,417</td>
<td>99</td>
</tr>
<tr>
<td>Sheep Creek-Johnson Creek</td>
<td>10,403</td>
<td>3,178</td>
<td>28</td>
</tr>
<tr>
<td>Lunch Creek-Johnson Creek</td>
<td>15,414</td>
<td>7,322</td>
<td>98</td>
</tr>
<tr>
<td>Headwaters Johnson Creek</td>
<td>23,385</td>
<td>10,305</td>
<td>89</td>
</tr>
<tr>
<td>Warm Lake Creek</td>
<td>15,093</td>
<td>6,820</td>
<td>160</td>
</tr>
<tr>
<td>Six-Bit Creek South Fork Salmon River</td>
<td>15,087</td>
<td>7,105</td>
<td>63</td>
</tr>
<tr>
<td>Curtis Creek</td>
<td>17,476</td>
<td>8,280</td>
<td>74</td>
</tr>
<tr>
<td>Upper Big Creek</td>
<td>18,436</td>
<td>13,429</td>
<td>103</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

1 The eastern portion of the No Man’s Creek-East Fork SFSR subwatershed is within the PNF and the western portion is in the BNF.
3.5.4.9 Existing Detrimental Disturbance

DD is the alteration of natural soil characteristics that results in immediate or prolonged loss of soil productivity and soil-hydrologic conditions. Areas considered for TSRC are excluded from this requirement, but DD applies to vegetation clearing for new and upgraded utility corridors in areas that are available for multiple uses on NFS lands. The activity area for DD has been defined as the new and upgraded transmission line corridor where it occurs on NFS lands. Existing DD within the transmission line ROW is estimated at 8 percent. This is an estimate based on average extent of DD from ground-based forest harvesting operations in the Forest Service Northern Region (Reeves et al. 2012).

3.6 Noise

3.6.1 Introduction

This section presents a description of the affected noise environment as it relates to humans and human activity. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Effects of noise on non-human species is addressed in Sections 4.12 and 4.13 for fish and wildlife, respectively.

3.6.2 Noise Area of Analysis

The analysis area for noise includes areas within a five-mile radius of the major SGP components (i.e., the Operations Area Boundary, access routes, utilities, and off-site facilities) (Figure 3.6-1). Noise levels vary throughout the analysis area because noise levels attenuate (i.e., decrease) as a function of the distance from the source (i.e., divergence), ground absorption, atmospheric conditions, and the presence of physical barriers.

3.6.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to Noise. Additional descriptions of these regulations can be found in the SGP Noise Specialist Report (Forest Service 2022d).

Land and Resource Management Plan: The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for noise and include various objectives, guidelines, and standards for this purpose.
Noise Control Act of 1972: The Noise Control Act of 1972 established a national policy to promote an environment free from noise that jeopardizes public health or welfare and directed the EPA to identify acceptable limits under various conditions that would protect public health and welfare with an adequate margin of safety. EPA published a summary of these acceptable limits in 1978, as follows:

1. $L_{EQ1h}$ of less than or equal to 55 dBA for outdoor areas where people spend limited amounts of time (i.e., school yards or playgrounds).

2. $L_{DN}$ of less than or equal to 55 dBA for outdoor areas at residences, farms, and other areas where people spend varying amounts of time, where quiet is a basis for the use of such areas.

The protective levels should “not be viewed as standards, criteria, regulations, or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population will be at risk from any identified effects of noise” (EPA 1978); therefore, the EPA levels are guidance levels rather than enforceable standards or regulations and do not apply to biological resources such as fish and wildlife.

EPA Guidance on Ambient Noise Levels: Guidance on safe noise levels, which can be used to assess impacts of a project on public health and welfare, is available from EPA (1974, 1978). Table 3.6-1 shows outdoor and indoor noise levels identified by EPA to protect public health and welfare, expressed as $L_{EQ24h}$ or $L_{DN}$ (based on the dBA over a 24-hour period). Acceptable noise levels are not “peak” but are 24-hour averages over several years and represent levels where the general population would not be expected to be at risk from the identified effects of the noise (EPA 1978).

<table>
<thead>
<tr>
<th>Effect</th>
<th>Safety Level</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing Loss</td>
<td>$L_{EQ24h} \leq 70$ dBA</td>
<td>All areas.</td>
</tr>
<tr>
<td>Outdoor Activity Interference and Annoyance</td>
<td>$L_{DN24h} \leq 55$ dBA</td>
<td>Outdoors in residential areas and farms, and other outdoor areas where people spend widely varying amounts of time, and other places where quiet is a basis for use.</td>
</tr>
<tr>
<td>Indoor Activity Interference and Annoyance</td>
<td>$L_{DN} \leq 45$ dBA</td>
<td>Indoor residential areas. Other indoor areas with human activities, such as schools, etc.</td>
</tr>
<tr>
<td></td>
<td>$L_{EQ24h} \leq 45$ dBA</td>
<td></td>
</tr>
</tbody>
</table>

Source: EPA 1978

$\leq$ = less than or equal to

dBA = A-weighted decibel.

$L_{EQ24h}$ = Equivalent sound level for 24-hour period, expressed as dBA.

$L_{DN}$ = Day-night sound level, expressed as dBA.

$L_{DN24h}$ = Day-night sound level, expressed as dBA over a 24-hour period.

29 CFR 1910.95: The OSHA noise standards are described under 29 CFR 1910.95 for sound levels permissible by duration of work per day. When an employee is exposed to noises exceeding the limits, engineering controls and/or personal protective equipment need to be put in place.
30 CFR 62.130: The MSHA noise standards are described under 30 CFR 62.130. A miner cannot be exposed to noise exceeding the permissible exposure level of 115 dBA during any work shift without hearing protection.

3.6.4 Affected Environment

3.6.4.1 Landscape Features

The SGP is located in the PNF in the upper drainage basin for the East Fork SFSR. The area is characterized by narrow valleys surrounded by steep mountains. Elevations along the valley floors range from 6,000 to 6,600 feet above mean sea level. The surrounding mountains and areas in the FCRNRW reach elevations over 9,000 feet above mean sea level. Off-site facilities, much of the Burntlog Route, and the transmission line corridor are in the BNF with a similar topography and terrain. On the western edge of the Operations Area Boundary, access routes and transmission lines are in wider valley bottoms. Tall, dense trees and terrain obstructing the line-of-sight propagation of noise can reduce or eliminate the transmission of noise.

3.6.4.2 Noise-Sensitive Receptors

The SGP is located in the upper East Fork SFSR drainage approximately 44 air miles northeast of the City of Cascade, Idaho. The current access from SH 55 to the SGP is via Warm Lake Road to Johnson Creek Road (in summer) or SFSR Road (in winter), and then the Stibnite Road portion of the McCall-Stibnite Road (Figure 3.6-1).

Within the Operations Area Boundary, the primary human NSRs would be SGP workers. Outside the Operations Area Boundary, the primary human NSRs would be residents and recreational land uses (e.g., campgrounds, lookouts, trails, dispersed recreational uses in wilderness areas, including undeveloped campsites). A total of 12 sites were analyzed for baseline noise conditions and are discussed in the following section. Site 1 represents ambient sound levels near the Operations Area Boundary. Site 4 is not considered an NSR, but the sound levels measured there represent ambient sound levels in adjacent wilderness areas, similar to Site 3. Site 7 also is not considered to be an NSR but characterizes traffic noise along Warm Lake Road.

Residences are located near Warm Lake Road in Cascade and approximately seven miles east of SH 55 on the Southern Pines Plantation Property. Recreational land uses located near Warm Lake Road include the Warm Lake Campground, a Forest Service summer home, and recreational areas along the southwest shoreline of Warm Lake. These noise-sensitive receptors are in the vicinity of both the Johnson Creek Route and the Burntlog Route. Several residences, the Forest Service Camp at Landmark, and the Ice Hole Campground, are located near Johnson Creek Road between Warm Lake Road and Stibnite Road, with additional residences located near Johnson Creek Road in the village of Yellow Pine. The Meadow Creek Lookout is located just north of Meadow Creek Lookout Road, which would be used to access a portion of the Burntlog Route. The FCRNRW is located east of the Burntlog Route and there are several hiking trails in the vicinity, the closest being the Mule Hill Trailhead (NFS Trail [NFST] #219).
### 3.6.4.3 Baseline Ambient Noise Level Measurements

Outdoor baseline ambient sound levels were measured at five locations in the analysis area in July and August of 2014 and at four additional locations in July and August of 2016 (HDR 2017b, 2017c). NSRs analyzed with baseline noise measurements (Sites 1 through 9) are described in Table 3.6-2 and are shown on Figure 3.6-1. Sites with assumed nighttime human use, such as residences and campgrounds, are reported in dBA, L_{DN}; those with assumed daytime-only use are reported in dBA, L_{EQ}.

#### Table 3.6-2 Measured Baseline Ambient Sound Levels

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline dBA$^{1,2}$</th>
<th>Location and Existing Noise Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>East Fork SFSP Valley</td>
<td>40 L_{EQ1h}</td>
<td>Located in the East Fork SFSP valley near the mine pit locations to characterize baseline ambient noise levels where mine operations would occur.</td>
</tr>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>50-51 L_{DN}</td>
<td>Located near a residence on Johnson Creek Road between Stibnite Road and Meadow Creek Lookout site to characterize baseline ambient noise levels near the highway that trucks would use to access the SOP via the Johnson Creek Route$^3$.</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45 L_{EQ1h}</td>
<td>Located at the Meadow Creek Lookout site off Meadow Creek Lookout Road to characterize baseline ambient noise levels in undeveloped areas and near the Burntlog Route$^4$; general noise levels in adjacent wilderness areas.</td>
</tr>
<tr>
<td>Site 4</td>
<td>Burnt Log Road</td>
<td>40 L_{EQ1h}</td>
<td>Located approximately 100 feet from Burnt Log Road to characterize baseline ambient noise levels in undeveloped areas near the Burntlog Route, and for use in characterizing general noise levels in adjacent wilderness areas.</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>34-40 L_{DN}</td>
<td>Located at a Forest Service campground near Johnson Creek Road and Landmark Airfield to characterize baseline ambient noise levels near this higher volume roadway along the Johnson Creek Route where other noise sources (e.g., aircraft) also are present.</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Home/ Warm Lake Recreation Areas</td>
<td>34-49 L_{DN}</td>
<td>Located on the southwest shoreline of Warm Lake to characterize baseline ambient noise levels near Forest Service summer home and recreation areas associated with Warm Lake.</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road</td>
<td>47-52 L_{DN}</td>
<td>Located approximately 150 feet north of Warm Lake Road and directly east of Warm Lake to characterize baseline ambient noise levels along this frequently used road, at Warm Lake Campground, near the Burntlog Route.</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>61-64 L_{DN}</td>
<td>Located at a commercial shop along Warm Lake Road in Cascade, with a residence nearby, to characterize baseline ambient sound levels near the highway.</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>51-52 L_{DN}</td>
<td>Located approximately seven miles east of SH 55 along Warm Lake Road to characterize baseline ambient noise levels along this frequently used highway near a group of private residences.</td>
</tr>
</tbody>
</table>
Presented hourly LEQ values (LEQ1h) are averaged from daytime (i.e., from 7:00 AM and 10:00 PM) hourly baseline measurement data collected over a period of multiple consecutive days.

Presented LDN values are calculated from 24-hour baseline measurement data collected over a period of multiple consecutive days (HDR 2017b, 2017c).

The Johnson Creek Route is the current summer access from SH 55 to the SGP via Warm Lake Road, Johnson Creek Road, and Stibnite Road.

The Burntlog Route includes Warm Lake Road, Burnt Log Road, Thunder Mountain Road, and a new connector segment from Burnt Log Road to Thunder Mountain Road.

Three additional locations were identified as human use NSRs but were analyzed without baseline noise measurements (Sites 10 through 12). **Table 3.6-3** provides a description of these NSRs along with reference baseline sound levels. Measured noise levels were not available for these areas, but baseline levels were estimated based on similarity to other sites with measurements.

**Table 3.6-3** Additional Human Use NSRs and Estimated Ambient Baseline Sound Levels

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline dBA1,2</th>
<th>Location and Existing Noise Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>50-51 LDN</td>
<td>Located in Yellow Pine village. No noise measurements were taken from this site, but baseline sound levels assumed to be similar to Site 2, on the basis of similar distance to shared nearby roadway(s) and proximity of residences.</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/ BNF</td>
<td>50-51 LDN</td>
<td>Located at Ice Hole Campground in the BNF. No noise measurements were taken from this site, but baseline sound levels assumed to be similar to Site 2, on the basis of similar distance to shared nearby roadway.</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40-45 LEQ1h</td>
<td>Located at the Mule Hill Trailhead. No noise measurements were taken from this site, but ambient sound levels assumed to be in the range of Site 3 and Site 4 sound levels.</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

1Presented hourly LEQ values (LEQ1h) are averaged from daytime (i.e., from 7:00 AM and 10:00 PM) hourly baseline measurement data collected over a period of multiple consecutive days.

2Presented LDN values are calculated from 24-hour baseline measurement data collected over a period of multiple consecutive days (HDR 2017b, 2017c).

### 3.7 Hazardous Materials

#### 3.7.1 Introduction

This section addresses hazardous materials other than development rock and process tailings that would be utilized by the SGP. Hazardous materials are substances which may pose a risk to human health, wildlife, or the environment. Hazardous materials that would be used and/or transported for the proposed mining activities include diesel fuel, gasoline, lubricants, antifreeze, process reagents, antimony concentrate, mercury containing residuals, lime, explosives, and other substances.
When not properly managed, hazardous materials can represent potential risks to human health, the environment, and wildlife. Spills or accidental releases of hazardous materials can impact air, surface water, groundwater, soil, vegetation, wildlife, fish and other aquatic resources, and public health and safety; they can occur during transportation to and from a site, during storage and use activities, or through improper disposal of waste materials.

### 3.7.2 Hazardous Materials Area of Analysis

The components of the analysis area for hazardous materials are shown on Figure 2.4-1 and include the Operations Area Boundary (including all operational areas and haul roads); the proposed off-site facilities: SGLF and the Maintenance Facility locations; and the access roads including the Warm Lake Road (CR 10-579), from SH 55 in Cascade past the SGLF, continuing to Landmark; the Burntlog Route: Burnt Log Road (FR 447), new road segments, and segments of Meadow Creek Lookout (FR 51290) and Thunder Mountain (FR 50375) roads; and the Johnson Creek Route: Johnson Creek Road (CR 10-413) and the Stibnite Road portion of the McCall-Stibnite Road (Stibnite Road; CR 50-412), from the village of Yellow Pine to the Operations Area Boundary.

### 3.7.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and Alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to Hazardous Materials.

**The Occupational Safety and Health Administration** – Hazard Communication (29 CFR 1910.1200) provides a uniform system of labeling and communicating hazards associated with hazardous chemicals.

**Mine Health and Safety Hazard Communication Standards** – The MSHA regulations specify methods for testing, evaluation, and approval of mining products (30 CFR 5 through 36) and procedures for hazard communication which identifies chemicals at the mine, training to determine hazardous chemicals, and establishes a hazardous communication program (30 CFR 47).

**Idaho Hazardous Waste Regulations** - Idaho enforces regulations on hazardous waste administered through the IDEQ, under Idaho Administrative Code IDAPA 58.01.05. The regulations are identical to federal rules and incorporated by reference where applicable. Large mine operations like the SGP can generate quantities of regulated hazardous waste from laboratory and maintenance activities to require compliance with the federal and state hazardous waste regulations for generation, storage, shipping, and disposal of the hazardous wastes.

**U.S. Department of Transportation (USDOT) Hazardous Materials Transportation Permit** - The permit governs the transport of hazardous materials as defined by the USDOT and requires specific employee training, security, and contingency planning. The USDOT regulations in 49 CFR 100-185 define hazardous materials and establish regulations for the safe and secure transportation of hazardous materials in commerce. Consultation and coordination with the Federal Motor Carrier Safety Administration should be made for shipments of hazardous materials requiring a Hazardous Material Safety Permit, pursuant to 49 CFR 385.403.
Idaho Regulations on Ore Processing by Cyanidation - Idaho Statutes Title 49 Chapter 22 regulates the transportation of hazardous materials and wastes in the state. Regulations include requirements for permits, endorsements, insurance, various enforcement provisions including an enforcement fund, and other provisions to ensure safe hazardous waste transport in the state.

Idaho Regulations on Hazardous Materials/Waste Transport - Idaho has a state regulatory program for Ore Processing By Cyanidation (IDAPA 58.01.13). This program establishes a permitting program for process facilities using cyanide for construction, operations, and closure of facilities that contain, treat, or dispose of process water. The rules specify the necessary contents of a permit application and establish minimum engineering plans and specifications for impoundments, leach pads, and other facilities designed to contain process water.

Department of Justice, Bureau of Alcohol, Tobacco Firearms and Explosives - The agency regulates the sale, possession, transport, storage, security, and use of explosives. The agency also plays a vital role in regulating and educating the explosives industry (27 CFR Part 447).

The International Cyanide Management Code - A voluntary initiative for the gold and silver mining industries and provides guidelines pertaining to the manufacture, transportation, storage, and use of cyanide. Perpetua Resources has indicated their intent to design and operate the cyanidation facility in compliance with the ICMC.

Comprehensive Environmental Response, Compensation, and Liability Act – CERCLA and its regulations enforced by the EPA (Superfund, 40 CFR 300-375) establish liability provisions related to the clean-up of hazardous waste sites, accidents, spills and other releases, pollutants, and contaminants to the environment. Hazardous substances are included in 40 CFR Table 302.4, which lists hazardous substances and reportable quantities in the event of a release of these substances to the environment. In 2021 Perpetua voluntarily entered into an ASAOC with EPA and the Forest Service to conduct certain CERCLA response actions to address environmental effects at the SGP mine site caused by legacy mine operations that preceded Perpetua's involvement in the property (Section 1.3).

Resource Conservation and Recovery Act - Hazardous wastes, as defined in Subtitle C of the federal RCRA regulations, are governed by the EPA in 40 CFR 260-273 and also in the Idaho equivalent state Hazardous Waste Management Act and Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05). The regulations apply to the generation, storage, transport, and disposal of regulated hazardous waste. In Idaho, the IDEQ has primacy for regulation of hazardous wastes under IDAPA 58.01.05 which conform to the federal regulatory requirements.

The Oil Pollution Act of 1990 – This act amended the CWA to address prevention, response, and cleanup for oil pollution incidents. This act requires qualifying oil storage facilities to develop SPCC plans in accordance with 40 CFR 112.

EPA Risk Management Plan Rule - Section 112(r) of the 1990 CAA Amendments sets forth a series of requirements aimed at preventing and minimizing the consequences of accidental chemical releases. These requirements are the basis of a rule on “Risk Management Programs for Chemical Accidental Release Prevention” promulgated by the EPA on June 20, 1996 (40 CFR 68). The rule applies to public
and private facilities that manufacture, process, use, store, or otherwise handle regulated substances at or above specified threshold quantities. The rule requires facilities that use extremely hazardous substances to develop a Risk Management Plan with critical information to assist local fire, police, and emergency response personnel in preparation for and response to chemical emergencies.

**National Forest Land and Resource Management Plan** - The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition related to hazardous materials transport, use, and disposal and include various objectives, guidelines, and standards for this purpose.

### 3.7.4 Affected Environment

The SGP area has been extensively disturbed by past mining activities (Figure 3.7-1). Past activities involved the use of hazardous materials including, but not limited to fuels, lubricants, hydraulic oils, and chemical reagents including sodium hypochlorite, sodium hydroxide, copper sulphate, lead acetate, and cyanide (Bradley et al. 1943). See **Section 1.3** for a description of the past mining, milling, and heap leach activities at the site.

#### 3.7.4.1 Operations Area Boundary

Current exploration-related activity is occurring in the three major identified deposits at the mine site: Yellow Pine, West End, and Hangar Flats (Figure 2.4-2) as well as those areas as defined in the Golden Meadows Exploration Project Plan of Operations (Midas Gold 2011, 2016b).

Centrally located support facilities for these exploration activities include the personnel camp, offices, maintenance shop area, a helipad and hangar, and an airstrip.

Perpetua currently stores and uses various substances classified as hazardous materials for ongoing exploration activities. These include petroleum products (e.g., fuels, lubricants, and motor oils), over-the-counter cleaning agents, batteries, tires, and other routine materials used to support drill rigs, generators, water pumps, vehicles, helicopters, and other operating needs (HDR 2017d).

Existing fuel infrastructure for the exploration activities consists of a primary fuel storage area, a secondary fuel storage area, the shop area, and the Hangar Flats fuel storage area. **Table 3.7-1** summarizes petroleum use and storage locations at the existing exploration operations. The primary fuel storage area is covered. The secondary fuel storage area is located near the shop (Figure 3.7-2). The primary diesel generator is located at the personnel camp northwest of the shop area (Figure 3.7-2). The other two generators at the shop area are used as backup power generation for offices and water facilities. Southwest of the shop area is the Hangar Flats fuel storage area.

The storage tanks are situated within secondary containment and routinely checked for tank leakage or spillage. If spills occurred, they would be retained within the secondary containments designed to at least contain 110 percent of the largest tank in the containment. They would be responded to and reported in accordance with the current site SPCC Plan, as well as state and federal regulations (HDR 2017d).
The above ground storage tanks (ASTs) meet the requirements of the Oil Prevention Pollution regulation (40 CFR 112). Perpetua annually reports on-site diesel and Jet A fuel storage in accordance with Tier II reporting requirements under the Emergency Planning and Community Right-to-Know Act (40 CFR 370).

Perpetua has developed a solid waste management plan to assist with the storage, handling, and disposal of solid, special, and hazardous waste streams (HDR 2017d). This plan was developed in accordance with state and federal regulations pertinent to waste, although the existing exploration activities are currently considered a Very Small Quantity Generator under RCRA (40 CFR262.14). The solid waste management plan establishes procedures to identify hazardous waste and provides protocols to track, collect, and dispose of hazardous materials in accordance with state and federal regulations. The plan also outlines methods to minimize the generation of hazardous waste (e.g., using industrial soaps in place of solvents wherever possible).

Table 3.7-1  Petroleum Storage Locations, Types, and Volumes

<table>
<thead>
<tr>
<th>Location</th>
<th>Contents</th>
<th>No. of Tanks</th>
<th>Quantity per tank (gallon)</th>
<th>Containment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Fuel Storage Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Farm Diesel</td>
<td>4</td>
<td>10,000</td>
<td></td>
<td>Double-walled tanks, concrete basin</td>
</tr>
<tr>
<td>Fuel Farm Diesel</td>
<td>2</td>
<td>4,000</td>
<td></td>
<td>Double-walled tanks, concrete basin</td>
</tr>
<tr>
<td>Fuel Farm Diesel</td>
<td>2</td>
<td>500</td>
<td></td>
<td>Single-walled portable tanks, concrete basin (inactive)</td>
</tr>
<tr>
<td><strong>Secondary Fuel Storage Area and Hanger Fuel Storage Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near Shop Gasoline</td>
<td>2</td>
<td>2,500</td>
<td></td>
<td>Double-walled tank with HDPE-lined tertiary containment</td>
</tr>
<tr>
<td>Near Hangar Jet A</td>
<td>1</td>
<td>5,000</td>
<td></td>
<td>Double-walled tank with HDPE-lined tertiary containment</td>
</tr>
<tr>
<td>Near Hangar Diesel</td>
<td>1</td>
<td>2,500</td>
<td></td>
<td>Double-walled tank with HDPE-lined tertiary containment</td>
</tr>
<tr>
<td>Near Hangar Av-gas</td>
<td>3</td>
<td>55</td>
<td></td>
<td>Single-walled tanks, 55-gallon fuel storage drums, HDPE-lined secondary containment</td>
</tr>
<tr>
<td><strong>Shop Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside Shop Used Oil</td>
<td>2</td>
<td>500</td>
<td></td>
<td>Double-walled tank</td>
</tr>
<tr>
<td>Shop Generator Diesel</td>
<td>1</td>
<td>&lt;250</td>
<td></td>
<td>Lined secondary containment</td>
</tr>
<tr>
<td>Main Power Generator Diesel</td>
<td>1</td>
<td>&lt;250</td>
<td></td>
<td>Double-walled tank</td>
</tr>
<tr>
<td>Backup Generator Diesel</td>
<td>1</td>
<td>&lt;250</td>
<td></td>
<td>Lined secondary containment</td>
</tr>
<tr>
<td><strong>Miscellaneous Fuel Storage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestrin Well – Hangar Flats Water Station</td>
<td>1</td>
<td>&lt;250</td>
<td></td>
<td>Lined secondary containment</td>
</tr>
</tbody>
</table>

Source: Midas Gold 2017d  
HDPE = high density polyethylene
Figure 3.7-1
Past Mining and Related Activities at the Mine Site
Stibnite Mining District
Stibnite Gold Project
Stibnite, ID
Base Layer: Hillshade derived from LIDAR supplied by Perpetua Gold
Other Data Sources: Perpetua Gold; Boise National Forest; Payette National Forest

Legend:
- Roads
- Disturbance Areas
- Underground Workings
- Patented Claims

1 inch = 3,500 feet when printed at 8.5x11 in
3.7.4.2 Access Roads

Current access roads used for the transport of hazardous materials to the mine site include Warm Lake Road (CR 10-579) from Cascade, continuing to Landmark and then on Johnson Creek Road (CR 10-413) to the village of Yellow Pine and Stibnite Road (CR 50-412) to the mine site.

The largest volume of hazardous materials currently used at the mine site is petroleum hydrocarbons (e.g., diesel, unleaded gasoline, and Jet A fuel). Fuels are transported to the site via tanker truck; the transportation of these fluids presents the greatest existing risk for spills and releases to the environment. Exploration-related fuel transportation to the site by Perpetua has been occurring since 2011 and, through 2021, has consisted of deliveries by 288 fuel tankers, each with a capacity between 4,000 and 4,500 gallons. This work was performed under the fuel transportation Standard Operating Procedure protocol ESOP_004 Fuel Transportation (Midas Gold 2022). There have been no reported spills or releases associated with the transport of this fuel. There was a small fuel spill associated with a plane crash in February 2012, described further below.

3.7.4.3 Past Releases, Remediation, and Mitigation

Previous reclamation, remediation, and mitigation activities conducted in the SGP area by other operators are described in detail in the Hazardous Materials Baseline Report completed in 2015, updated in 2017 (HDR 2017d). The baseline report also presents a listing of recognized environmental conditions identified during previous environmental assessments conducted in 2010. The January 15, 2021, Action Memorandum by the EPA on the Stibnite Mine Site Time Critical Removal Action, Valley County, Idaho under CERCLA includes information on the mining history, descriptions of past releases of hazardous substances and pollutants, and listing of past remedial actions undertaken at the Stibnite site.

- Past mining activities have deposited metals, spent and neutralized ore, waste rock, and mine tailings over portions of the SGP site. Contaminants associated with past mine operations include metals and cyanide in area soil, groundwater, surface water, seeps, and sediments.
- The Stibnite mine was placed on the Federal Facilities Docket in 1991 CERCLIS No. 9122307607. The Stibnite/Yellow Pine mining area was proposed for listing on the National Priorities List (NPL) by EPA in 2001, but no further action to list the site on the NPL has been pursued by the agency since then.

The legacy mining and processing activities of the SGP vicinity, and the CERCLA status of these disturbances are described in Sections 1.2 and 1.3. Antimony, arsenic, copper, lead, mercury, and cyanide are the hazardous substances and pollutants that have been released into the local environment from mine wastes. Previous mine operations have also caused alterations to local streams and aquatic habitats. Much of the early mining development at the site took place before environmental regulations on the use, handling, and disposal of hazardous materials were in place. While there is no sampling or investigation data to confirm, it is possible that there are spills of hazardous materials (such as petroleum hydrocarbons) located below existing mining wastes at the site.
In January 2021, Perpetua entered into an ASAOC with the EPA and the Forest Service to conduct certain CERCLA response actions to address remaining mine waste impacts and study others (Section 1.3). The first phase of these removal actions is independent of the proposed SGP and are planned to be implemented between 2022 and 2024. Phase 1 removal actions include: diverting clean surface water around certain source areas, Lower Meadow Creek Valley tailings removal (25,000 tons), Bradley Man Camp dumps removal and onsite repository development (200,000 tons), and Northwest Bradley Dump stream waste removal and slope stabilization (100,000 tons). Phase 1 also includes certain baseline studies of conditions at five historic mine adits where mine water is discharging. Following phases would depend on agreement for implementation by Perpetua, EPA, and Forest Service.

The following remediation efforts associated with hazardous substances and other contaminated materials at the mine site have been conducted:

- **1982 to 1997:** mine operators placed the SODA over the previously deposited (and unlined) Bradley mill tailings to reduce erosion of the tailings.
- **1996 to 1997:** mine operator SMI redirected discharge from and draining of the Meadow Creek Pond that lay behind the Bradley Tailings and began construction of a diversion channel to reduce contact of stream flow with the tailings.
- **1998:** Mobil Oil Corporation constructed a new stream channel for Meadow Creek on the south side of the Bradley Tailings and SODA; built a new diversion channel on the north side; lined the old Meadow Creek diversion channel; closed a pond and covered 5 acres of exposed tailings at the upper end of the Bradley Tailings/SODA; regraded and revegetated 100 acres of the Bradley Tailings/SODA; revegetated the diversion channel; and installed stream restoration features (pools and boulders).
- **1998 to 2004:** The EPA, IDL, and IDEQ conducted various tailings and waste removal actions in the Monday Camp area (south end of the Yellow Pine pit); in other areas around the Yellow Pine pit development rock storage areas; and removal and disposal of petroleum contaminated soils in the current shop area.
- **2000:** Waste oil, waste oil-contaminated debris, sludge, and asphalt sealer stored in ASTs at the site were removed and disposed of in accordance with the applicable laws and regulations governing disposal of hazardous waste (HDR 2017d).
- **2002:** The Forest Service removed partial smelter stack and remaining ash in the stack for off-site disposal. Removed contaminated soil and ash from portion of stack that burned in the 2000 forest fire and placed in an unlined Forest Service repository on site, located on top of the NW Bradley Waste Rock Pile. Highly contaminated ash and the wooden stack was disposed off-site at an EPA regulated disposal facility (Clean Harbors).
- **2004 and 2005:** The Forest Service reconstructed about 3,300 feet of Meadow Creek including removal of most of the tailings from the channel on public lands and planting willows. These materials were placed in a containment cell on the SODA. The old channel was partially backfilled and reclaimed.
- **2005:** Removed contaminated and hazardous materials from the Stibnite Mill building and reportedly disposed off-site (HDR 2017d).
- **2009:** The Forest Service regraded and covered a portion of the remaining tailings at the Smelter Flats area including construction of a diversion ditch.
2012: A reportable fuel spill occurred at the site on February 14, 2012. The spill was caused by an airplane crash at the site. The crash released approximately 100 gallons of diesel fuel onto a road adjacent to the airstrip. Snow, ice, and approximately 8 cubic yards of impacted soil were excavated and removed from the site for treatment. No further action was required. Several federal agencies including EPA and the Forest Service, settled its CERCLA liability in the 2012 Bradley consent decree.

Results of a regulatory database search conducted by the Forest Service Krassel Ranger District in 2015 revealed several operators at various sites within the former mine and processing area were listed as having historical incidents or violations involving ASTs and underground storage tanks, RCRA, and CERCLA (HDR 2017d).

- Pioneer Metals installed one gasoline underground storage tank in 1981 near the Stibnite West End Mine in Yellow Pine. It was closed and removed from the ground in 2002.
- Several historical petroleum releases, the largest of which was a major petroleum leak in 1990 from ASTs providing fuel to power generators adjacent to the Pioneer/Stibnite Mine, Inc. processing facilities. Petroleum-contaminated soil was excavated, and limited groundwater remediation was conducted because diesel fuel was reportedly present on the groundwater’s surface. The site of the release was never closed and Stibnite Mine, Inc. was never formally released from liability.
- Several RCRA violations based on earlier mining activities, including a confirmed mining metals release in 1979. RCRA wastes from the Stibnite Mine, Inc. mill building, assay laboratory, pilot plant, and machine shop were containerized and transported off site for proper disposal during historic site cleanup.
- In addition, a recent review of the IDEQ Terradex Facility Mapper, which provides online access to Idaho and EPA regulatory database listings, revealed the following listings associated with former operators of the mine site (IDEQ 2019b): Hecla Mining Company Yellow Pine is listed on Mine Cyanidation Permit Facilities (CN000012), Hecla Mining Company Yellow Pine: General Mine Sites (GM0069); Mine Remediation Action Sites (RA0069); RCRA Hazardous Waste Sites (IDD980665459); and Midas Gold Mine General Mine Sites (GM0301).

### 3.8 Surface Water and Groundwater Quantity

#### 3.8.1 Introduction

The following section describes existing conditions related to surface water quantity, groundwater quantity, and water rights.

#### 3.8.2 Water Quantity Resources Area of Analysis

The analysis area for surface water and groundwater quantity encompasses the land where activities associated with the action alternatives could affect stream flows, groundwater levels, groundwater flow directions, groundwater-dependent ecosystems, and water rights. Such actions would be concentrated at the SGP and include groundwater withdrawal, streambed alteration/diversion, and surface water management. Open pits excavated below the water table require lowering of the water table via removal
of groundwater that would otherwise fill the pit. This is typically achieved by pumping from wells installed around the pit or sumps within the pit. Such pumping can affect nearby surface waters that are to some degree in hydraulic communication with a groundwater system.

The water quantity analysis area encompasses the 12-digit HUCs or sub-watersheds that overlap the proposed SGP. The Operations Area Boundary is near the upper end of the East Fork SFSR within two sub-watersheds: Headwaters East Fork SFSR and Sugar Creek. A portion of the analysis area includes the upper drainage area of the East Fork SFSR (to downstream of the confluence with Sugar Creek), as well as several tributaries of the East Fork SFSR. Those include EFMC (i.e., Blowout Creek), Meadow Creek, Rabbit Creek, Fiddle Creek, Hennessy Creek, Midnight Creek, Garnet Creek, Sugar Creek, and West End Creek, as shown on Figure 3.8-1 (within the “SGP Water Modeling Boundary”). The analysis area for surface water and groundwater quantity that could be directly or indirectly affected by the SGP consists of the area where activities associated with the action alternatives could affect stream flows and/or the quantity of groundwater in storage, groundwater levels, and groundwater transmission.

Groundwater within the analysis area moves primarily through unconsolidated alluvium; groundwater flow via deep bedrock is considered minor in comparison (see discussion of hydraulic conductivity of alluvial materials and bedrock formations presented below). Because most of the groundwater moves through unconsolidated alluvium, the boundaries of the Sugar Creek and Headwaters East Fork SFSR sub-watersheds also represent a reasonable approximation of the area subject to analysis of groundwater quantity impacts arising from the SGP. Note that the SGP might still alter streamflow conditions (including access roads, utilities, and off-site facilities) outside the analysis area; however, such alterations are expected to be minor based on regulatory requirements for these alterations and the application of best management practices.

The analysis area for water rights is the same as used for surface water and groundwater quantity analysis (Figure 3.8-1) and covers the sub-watersheds of Sugar Creek and the Headwaters East Fork SFSR. The Water Rights discussion identifies instream flow water rights held by Idaho Water Resource Board and the Forest Service that are located downstream from the analysis area on the South Fork of the Salmon River and on the Salmon River.

The direct and indirect effects associated with surface water and groundwater quantity are considered in the overall context of the local and regional hydrological and hydrogeological conditions of the affected environment. The following are the main characteristics of those conditions:

- The SGP and surrounding area (i.e., the analysis area) consists of mountainous terrain dissected by typically narrow valleys with steep slopes.
- The hydrology of the analysis area is strongly influenced by seasonal patterns of snow accumulation during the winter, and snowmelt in the spring and early summer.
- Water entering the analysis area as precipitation migrates as surface runoff and shallow groundwater down the mountain slopes and along the valley bottoms in an alluvial aquifer formed by unconsolidated Quaternary deposits of sediment. The alluvial aquifer is documented to be the most groundwater-transmissive formation in the analysis area; it is typically more than 50 feet thick (reaching a thickness of 250 feet at some locations).
Figure 3.8-1
Water Quantity Analysis Area
Stibnite Gold Project
Stibnite, ID

Base Layer: ESRI USA Topographic Basemap
Other Data Sources: Perpetua; Boise National Forest; Payette National Forest

LEGEND
Surface Water Analysis Area
Mine Site Water Modeling Boundary
Mine Site Components

Watersheds
Upper Middle Fork Salmon (17060205)
South Fork Salmon (17060206)
Lower Middle Fork Salmon (17060206)
Stream/River

*Mine Site components are associated with all Alternatives
Note: Subwatersheds displayed are Hydrologic Unit Code (HUC) 6th level (12-digit)
• Groundwater in the alluvial aquifer eventually discharges to surface streams. However, at some locations, surface water recharges shallow groundwater during periods of high stream stage.

• Groundwater supports many seep-, spring- and wetland ecosystems referred to as groundwater dependent ecosystems (GDEs).

• A portion of groundwater flow occurs through a network of fractures in shallow bedrock and through fracture zones (encountered in boreholes) and faults. Shallow bedrock is less transmissive than the alluvial aquifer, but more fractured and transmissive than deeper bedrock which is less transmissive.

• The MCFZ acts as an aquitard to bedrock flow based on observations of surface water expressions above the fault zone gouge outcrops and artesian conditions observed in drillholes in its vicinity where it passes between the Yellow Pine pit and West End areas.

• There are four existing water rights held by Perpetua in the vicinity of the Operations Area Boundary that are related to historical mining use, but there are no downstream consumptive-use water rights on the East Fork SFSR.

### 3.8.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the 2021 MMP and action alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to water quality resources. Additional descriptions of these regulations can be found in the SGP Water Quantity Resources Specialist Report (Forest Service 2022e).

**Land and Resource Management Plan:** Physical, social, and biological resources on NFS lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. National Forest Land and Resource Management Plans embody the provisions of the NFMA and guide natural resource management activities on NFS land.

In the SGP area, the Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for surface water and groundwater quantity and include various objectives, guidelines, and standards for this purpose.”

**Federal Laws, Regulations, and Policy:** The USACE regulates the discharge of dredged, and/or fill material within WOTUS pursuant to Section 404 of the CWA. The USACE does not regulate water rights in Idaho, but SGP activities that could alter surface water quantity may be regulated and require a USACE authorization.

In 2004, the Main Salmon, Middle Fork Salmon, Rapid, Selway, Lochsa, and Middle Fork Clearwater rivers were designated as WSRs under the Wild and Scenic Rivers Act (16 USC 1271-1287), which reserves instream water rights for designated rivers, and requires additional administration of existing and new water rights pursuant to state law.

**State and Local Laws, Regulations, and Policy:** The IDWR regulates mine tailings impoundments with dams higher than 30 feet and administers regulations that may have to be considered when a tailings impoundment affects surface water hydrology.
The IDWR also is responsible for administration of water rights, well construction standards, dam safety, and stream channel alteration. Any water right to implement the SGP would need to be granted to the applicant by the State of Idaho through IDWR. The constitution and statutes of the State of Idaho declare all waters of the state to be public but provide the right to divert public waters to put them to beneficial use, which includes mining activities (IDWR 2019; Idaho Const. art. XV, § 1).

A water right is obtained through an application to IDWR. The agency must ensure enough water is available for the water right and that the oldest (senior) water rights are satisfied first (IDWR 2019). Water rights associated with mining projects are protected from forfeiture under Idaho Code 42-223(11).

Valley County reviews development proposals for consistency with the County’s Land Use Development Ordinance. When permits are required by other agencies for all or parts of the application, evidence of the permit and compliance with the provisions of the permit are to be a condition of the land use approval. This includes permits to alter wetlands; permits to construct in flood prone areas; and in other situations where the review and issuance of the permit would ensure that the proposal would be technically feasible.

### 3.8.4 Affected Environment

#### 3.8.4.1 Hydrologic and Geologic Setting

The SGP is located in mountainous terrain with typically narrow valleys and steep slopes. Elevations range from 6,000 to 6,600 feet amsl along valley floors and rise to elevations exceeding 8,500 feet amsl in the surrounding mountains (HydroGeo 2012a).

The climate of the analysis area is influenced by local patterns of wind, precipitation and temperature influenced by topography, slope aspect, and elevation. The analysis area experiences wide annual and diurnal variations in temperature and humidity. During winter, storms typically move through the region resulting in snowfall accumulations of two feet or more. Cloudy and unsettled weather is common during the winter with measurable precipitation occurring on about one-third of the days (Brown and Caldwell 2017a, Section 4; Stantec and Trinity Consultants 2017).

Spring months are normally wet and windy with weather conditions fluctuating quickly. Afternoon temperatures in the 30s and 40s (degrees Fahrenheit) with precipitation in the form of rain or snow may occur interspersed with periods of sunny skies and temperatures in the 50s or 60s °F. Low elevation snowpack usually melts quickly during the spring, but high elevation snowpack can persist into June or later (Stantec and Trinity Consultants 2017).

Although snowmelt may take one month or more in the analysis area, summer weather may begin suddenly with a rapid change to warm and dry weather. Although daytime temperatures are usually warm by June, chilly nights can persist throughout the summer. Showers are common from late spring through summer with an increased frequency surrounding regional high terrain. Afternoon temperatures often rise into the 80s (°F); however, low humidity usually results in overnight temperatures in the 50s (°F) or even cooler (Stantec and Trinity Consultants 2017).

Autumn has cooler weather with daytime highs generally in the 60s (°F) in early fall, dipping into the mid-30s (°F) by mid-November with generally dry conditions, except for the first of the progressive
winter storms. The first cold wave with highs below 20°F and lows around 0°F or lower may arrive any time between late November and late December (Stantec and Trinity Consultants 2017).

The winds in the analysis area follow the traditional up and down valley flow patterns expected in mountain valleys. During the spring months, periods of high winds may persist for days at a time. Winds have a strong tendency toward northeast directionality. Speeds vary widely but tend to be strongest from the southwest (Stantec and Trinity Consultants 2017).

The main East Fork SFSR valley floor is around 6,400 feet in elevation and the tributary valleys—which are at higher elevations like Meadow Creek, Fiddle Creek, Hennessy Creek, and Sugar Creek—all show a strong and pronounced asymmetry with steeper south-facing slopes (Midas Gold 2017e). South-facing slopes are more open to sunlight and warm winds and are thus generally warmer and dryer because of the higher levels of evapotranspiration compared to steep north-facing slopes.

A long-term climatological record is not available for the SGP. Therefore, Parameter-elevation Regressions on Independent Slope Model (PRISM) data compared with the NWS and SNOTEL Secesh Summit site is used to develop average precipitation and temperature estimates (Table 3.8-1). The Secesh Summit site is located 35 miles northwest of the SGP, at a comparable elevation (Brown and Caldwell 2017a).

**Table 3.8-1** Estimated Average Monthly Precipitation and Temperature for the Analysis Area

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Precipitation (inches)</th>
<th>Average Temperature (°F)</th>
<th>Minimum Temperature (°F)</th>
<th>Maximum Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>4.11</td>
<td>20.10</td>
<td>10.67</td>
<td>29.52</td>
</tr>
<tr>
<td>February</td>
<td>3.32</td>
<td>21.75</td>
<td>9.84</td>
<td>33.66</td>
</tr>
<tr>
<td>March</td>
<td>3.53</td>
<td>27.68</td>
<td>15.33</td>
<td>40.03</td>
</tr>
<tr>
<td>April</td>
<td>2.98</td>
<td>32.89</td>
<td>20.50</td>
<td>45.27</td>
</tr>
<tr>
<td>May</td>
<td>2.58</td>
<td>40.69</td>
<td>27.73</td>
<td>53.65</td>
</tr>
<tr>
<td>June</td>
<td>2.14</td>
<td>48.73</td>
<td>33.85</td>
<td>63.61</td>
</tr>
<tr>
<td>July</td>
<td>0.95</td>
<td>58.05</td>
<td>41.31</td>
<td>74.79</td>
</tr>
<tr>
<td>August</td>
<td>0.91</td>
<td>56.47</td>
<td>39.18</td>
<td>73.76</td>
</tr>
<tr>
<td>September</td>
<td>1.81</td>
<td>48.70</td>
<td>32.76</td>
<td>64.63</td>
</tr>
<tr>
<td>October</td>
<td>2.10</td>
<td>39.18</td>
<td>25.97</td>
<td>52.39</td>
</tr>
<tr>
<td>November</td>
<td>3.71</td>
<td>26.34</td>
<td>17.02</td>
<td>35.63</td>
</tr>
<tr>
<td>December</td>
<td>3.99</td>
<td>18.82</td>
<td>9.28</td>
<td>28.36</td>
</tr>
<tr>
<td>Annual</td>
<td>32.19</td>
<td>36.61</td>
<td>23.61</td>
<td>49.60</td>
</tr>
</tbody>
</table>

Source: 800-meter PRISM data, Brown and Caldwell 2017a
The spatial and elevation distribution of average precipitation and temperature are described in more detail in the SGP Water Resources Summary Report (Brown and Caldwell 2017a, Section 4).

The local geology of the analysis area contains four primary lithologic units (Smitherman 1985, USGS 2007, Brown and Caldwell 2017a):

- Neoproterozoic to Ordovician carbonate and siliciclastic metasedimentary rocks,
- Cretaceous Idaho Batholith dioritic to granitic compositions,
- Tertiary dikes, porphyries and volcanics of the Challis Volcanic Field, and
- Quaternary sedimentary alluvium.

Unconsolidated sedimentary deposits appear near the ground surface in the form of alluvial fans, terrace gravels, glacial tills, fluviium, colluvium, and landslide materials. Glacial moraines are evident in the larger valley areas. These unconsolidated alluvial materials are generally confined to the center of valley bottoms, surrounded by bedrock mountain slopes. Precipitation in the area infiltrates and moves through these unconsolidated deposits.

The bedrock in the project area has been compressed into northwest-southeast trending folds and offset with faults of similar trends. The bedrock has also been fractured with lesser amounts of fracturing at depth compared to shallower rock. Groundwater in the area moves through the fractured bedrock under the influence of local gradients and the hydraulic properties of the faults and fractures.

Fault zones were examined for evidence of influence on groundwater flow (HydroGeo 2012a, SPF 2017, Brown and Caldwell 2021e). Evidence of fault influence on groundwater flow was not detected for most faults, except for the MCFZ where artesian conditions on the east side of the fault in the West End pit area indicated that the fault acts as an inhibitor to flow in bedrock. Based on this observation, the MCFZ was represented in the groundwater flow model.

### 3.8.4.2 Surface Waters

#### Streams

The SGP is in the Headwaters East Fork SFSR and Sugar Creek sub-watersheds. The primary surface water features at the SGP include the East Fork SFSR and its tributaries (Figure 3.8-2), as well as intermittent drainages, ephemeral drainages, seeps, springs, wetlands, and ponds.

These features include 10 named surface water channels: the East Fork SFSR, Rabbit Creek, Meadow Creek, EFMC (also known as Blowout Creek), Garnet Creek, Fiddle Creek, Midnight Creek, Hennessy Creek, West End Creek, and Sugar Creek. Most of these streams occur in the Headwaters East Fork SFSR sub-watershed except for Sugar Creek and West End Creek, which are in the Sugar Creek sub-watershed. Brief descriptions of each stream are provided below, and specific drainage and channel characteristics are summarized in Table 3.8-2.
Table 3.8-2  Summary of Stream Characteristics in the SGP Area

<table>
<thead>
<tr>
<th>Drainage</th>
<th>Approximate Drainage Area (square miles)</th>
<th>Channel Length (miles)</th>
<th>Elevation Change (feet)</th>
<th>Average Gradient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR (upstream of Sugar Creek)</td>
<td>25.0</td>
<td>7.04</td>
<td>2,129</td>
<td>5.7</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>7.7</td>
<td>4.78</td>
<td>1,570</td>
<td>6.2</td>
</tr>
<tr>
<td>EFMC</td>
<td>2.4</td>
<td>2.66</td>
<td>1,491</td>
<td>10.6</td>
</tr>
<tr>
<td>Rabbit Creek</td>
<td>0.6</td>
<td>1.19</td>
<td>1,506</td>
<td>24.0</td>
</tr>
<tr>
<td>Garnet Creek</td>
<td>0.5</td>
<td>1.24</td>
<td>1,558</td>
<td>23.8</td>
</tr>
<tr>
<td>Fiddle Creek</td>
<td>2.0</td>
<td>2.47</td>
<td>1,444</td>
<td>11.1</td>
</tr>
<tr>
<td>Midnight Creek</td>
<td>0.9</td>
<td>1.83</td>
<td>2,205</td>
<td>22.8</td>
</tr>
<tr>
<td>Hennessy Creek</td>
<td>0.7</td>
<td>1.16</td>
<td>1,499</td>
<td>24.5</td>
</tr>
<tr>
<td>West End Creek</td>
<td>0.6</td>
<td>1.55</td>
<td>2,234</td>
<td>27.3</td>
</tr>
<tr>
<td>Sugar Creek</td>
<td>17.4</td>
<td>7.14</td>
<td>2,356</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a; HydroGeo, Inc. 2012b

The East Fork SFSR is a perennial stream that flows from southeast to northwest through the SGP and has a drainage basin of 25 square miles upstream of Sugar Creek. It is the principal stream draining the SGP and receives flow either directly or indirectly from all other drainages listed in Table 3.8-2. At ordinary high water, the East Fork SFSR is approximately 2 to 3 feet deep and 25 to 30 feet wide (Brown and Caldwell 2017a).

Historical mining activities have affected the course of the East Fork SFSR in the central portion of the SGP where it flows through a lake that has formed in the Yellow Pine pit. The river enters the pit on the south side and exits from the north. The flow velocity of the East Fork SFSR slows as it passes through the abandoned pit, causing the river to drop much of its sediment load which is then deposited across the lake bottom. The original Yellow Pine pit was excavated to a depth of 125 feet below the current pit lake level, but sediment deposited through time has reduced the lake depth to only 35 feet. The lake has a surface area of approximately 4.75 acres and is estimated to contain approximately 92 acre-feet of water (Brown and Caldwell 2017a). An artificial drop into the pit creates a steep whitewater cascade on the East Fork SFSR where it enters the pit and blocks upstream fish passage above the pit lake.

Meadow Creek originates southwest of the SGP, flows east into the East Fork SFSR, and drains an area of approximately 7.7 square miles. The Meadow Creek headwaters occur in an alpine lake, and the drainage contains multiple wetland complexes. At ordinary high-water, Meadow Creek is approximately 2 to 4 feet deep and 20 to 25 feet wide at the bottom of the drainage (Brown and Caldwell 2017a).

EFMC is a tributary to Meadow Creek that drains an area of 2.4 square miles in the southern end of the SGP (Figure 3.8-2). The creek previously supplied water to a man-made reservoir that provided hydroelectric power and process water to the historical mill and smelter. EFMC is locally referred to as Blowout Creek because the dam forming the reservoir breached in 1965, causing large-scale scouring of the steep channel downstream, and deposition of an alluvial fan. From its headwaters, EFMC meanders...
through a former wetland area that dried up due to stream incision and declining groundwater levels related to the dam failure.

Rabbit Creek and Garnet Creek are small tributaries of the East Fork SFSR that drain 0.6 and 0.5 square miles, respectively. Rabbit Creek is in a steep drainage that has steep side slopes, with numerous seeps and springs occurring throughout its headwaters. Garnet Creek is formed from seeps and springs located in the eastern portion of the SGP. The current shop, camp facilities, and the historical Garnet pit are in the Garnet Creek drainage. Historical waterworks from the 1940s and 1950s as well as a 1990s diversion are present below the former open pit.

Fiddle Creek occurs in a well-defined glacial cirque, drains an area of two square miles, and flows into the East Fork SFSR from the west. The drainage area for Fiddle Creek includes forested and open scree slopes. The middle reach of Fiddle Creek also contains a former reservoir and dam, and a former townsite occurs in the lower reach above and below the County Road. In addition, the creek itself was diverted from its natural outfall site to the north under the County Road through a culvert in the 1980s.

Midnight Creek is a small tributary that drains an area of 0.9 square mile and flows into the East Fork SFSR from the east, just above the Yellow Pine pit lake. Several miles of current and historical exploration and haul roads exist in the Midnight Creek drainage.

Hennessy Creek is a small tributary that drains an area of 0.7 square mile and flows into the East Fork SFSR from the west. The upper end of the drainage is heavily forested, and the lower portion of the drainage has been modified by current access roads and historical mine workings. Hennessy Creek also has a historical water diversion just above the county road that included a large pipe system. The creek flows in the direction of, and then adjacent to, Stibnite Road (CR 50-412) in a channel around the Bradley Northwest mine dump complex, disappears and then reemerges among historical mine development rock piles, and flows through a culvert before entering the East Fork SFSR.

West End Creek flows into Sugar Creek from the south and has a drainage area of 0.6 square mile. The drainage basin of West End Creek was modified extensively and diverted into a now failed French drain system during construction of the large waste rock dump in the middle reach. The current creek flow disappears and reemerges among historical waste rock piles. Several miles of current and historical exploration roads are present in the West End Creek drainage.

Finally, Sugar Creek is a relatively large tributary that drains an area of approximately 17.4 square miles and flows into the East Fork SFSR downstream of the Yellow Pine pit. A portion of the upper Sugar Creek valley has been impacted by past mercury mining activities at the former Cinnabar Mine, located in the upper Cinnabar Creek drainage which is a tributary to Sugar Creek. These activities included underground mine development and operations, development rock disposal, ore processing, deposition of tailings in the valley, construction and use of buildings and housing (several of which still exist), and road construction.
Figure 3.8-2
Streams Location Map
Stibnite Gold Project
Stibnite, ID

Data Review: Brown & Caldwell 2017

Legend
Study Area (Headwaters of EFSFSR)
Project Area
Drainages
Watersheds
South Fork Salmon (17060208)
Lower Middle Fork Salmon (17060205)
Upper Middle Fork Salmon (17060205)
Streams/Rivers

Basemap: 2013 National Geographic Society, i-cubed

0 6,000 12,000 Feet

DRAINAGES IN THE SUB-WATERSHEDS

<table>
<thead>
<tr>
<th>MAP ID</th>
<th>DRAINAGE NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Upper EFSF Salmon River</td>
</tr>
<tr>
<td>2</td>
<td>East Fork Meadow Creek</td>
</tr>
<tr>
<td>3</td>
<td>Meadow Creek</td>
</tr>
<tr>
<td>4</td>
<td>Fiddle Creek</td>
</tr>
<tr>
<td>5</td>
<td>Hennessy Creek</td>
</tr>
<tr>
<td>6</td>
<td>West End Creek</td>
</tr>
<tr>
<td>7</td>
<td>Midnight Creek</td>
</tr>
<tr>
<td>8</td>
<td>Garnet Creek</td>
</tr>
<tr>
<td>9</td>
<td>Rabbit Creek</td>
</tr>
<tr>
<td>10</td>
<td>Sugar Creek</td>
</tr>
</tbody>
</table>

Project Area

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2017)
Nine USGS streamflow gages (Figure 3.8-3) in and near the analysis area provide data to characterize the existing environment. Table 3.8-3 provides streamflow statistics for the nine USGS gaging stations, and Figure 3.8-4 presents average monthly discharge hydrographs for six active USGS gaging stations present in the Analysis Area. The hydrographs illustrate the snowmelt-dominated streamflow pattern observed in the area with flows beginning to rise in March and April and peaking in May or June, before receding to base flow conditions in late summer/fall and remaining low through the winter.

Baseflow and groundwater recharge estimates were derived using data from two of the USGS gaging stations in the analysis area (Brown and Caldwell 2017a). Those two stations, USGS 13311250 (located at the East Fork SFSR above Sugar Creek) and USGS 13311450 (located at Sugar Creek before its discharge to the East Fork SFSR) (Figure 3.8-3), together provide measurements that can be used to estimate groundwater recharge over the entire analysis area by calculating combined baseflow leaving the analysis area. These estimates assume that groundwater flow across the analysis area boundaries are negligible. The estimates also assume that during the periods of low flow (late summer, fall, and winter), the entire flow of each stream is derived from groundwater discharge into the stream. Stream discharges measured at the USGS gages during August, September, and October are interpreted to represent baseflow conditions (Brown and Caldwell 2017a). This interpretation is based on 1) analysis of hydrographs, 2) lack of significant precipitation during these months, and 3) minor flow variations during this period of year.

Considering approximate drainage areas for each of those two stations (18 square miles for Sugar Creek and 25 square miles for the East Fork SFSR [Brown and Caldwell 2017a]), groundwater recharge over the Sugar Creek and East Fork SFSR drainage areas was calculated to 8.1 inches per year over the alluvial valley bottom areas and 6.2 inches per year in the bedrock dominated mountainous areas. These values represent about 20 percent of the estimated annual precipitation for the SGP area, which is equal to 32.19 inches (Brown and Caldwell 2021a).
## Table 3.8-3  USGS Gaging Station Drainage Area and Flow Statistics

<table>
<thead>
<tr>
<th>Gage Number</th>
<th>Gage Name</th>
<th>Drainage Area (square miles)</th>
<th>Min (cfs)</th>
<th>Max (cfs)</th>
<th>Mean (cfs)</th>
<th>Period of Record (# years monitored)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13310850</td>
<td>Meadow Creek near Stibnite, Idaho</td>
<td>5.6</td>
<td>1.37</td>
<td>129</td>
<td>11.0</td>
<td>09/2011–02/2022 (10 years)</td>
</tr>
<tr>
<td>13310800</td>
<td>East Fork SFSR above Meadow Creek near Stibnite, Idaho</td>
<td>9.0</td>
<td>2.20</td>
<td>159</td>
<td>11.8</td>
<td>09/2011–02/2022 (10 years)</td>
</tr>
<tr>
<td>13311450</td>
<td>Sugar Creek near Stibnite, Idaho</td>
<td>18.0</td>
<td>4.00</td>
<td>252</td>
<td>22.9</td>
<td>09/2011–02/2022 (10 years)</td>
</tr>
<tr>
<td>13311250</td>
<td>East Fork SFSR above Sugar Creek near Stibnite, Idaho</td>
<td>25.0</td>
<td>4.39</td>
<td>366</td>
<td>36.9</td>
<td>09/2011–02/2022 (10 years)</td>
</tr>
<tr>
<td>13311500</td>
<td>East Fork SFSR near Stibnite, Idaho1</td>
<td>43.0</td>
<td>10</td>
<td>783</td>
<td>50.4</td>
<td>06/1928–09/1941 (13 years)</td>
</tr>
<tr>
<td>13312000</td>
<td>East Fork SFSR near Yellow Pine, Idaho1</td>
<td>107.0</td>
<td>28</td>
<td>1,660</td>
<td>142.4</td>
<td>08/1928–07/1943 (13 years)</td>
</tr>
<tr>
<td>13313000</td>
<td>Johnson Creek at Yellow Pine, Idaho</td>
<td>218.0</td>
<td>28</td>
<td>5,440</td>
<td>342.5</td>
<td>09/1928–02/2022 (93 years)</td>
</tr>
<tr>
<td>13310700</td>
<td>SFSR near Krassel Ranger Station, Idaho</td>
<td>330.0</td>
<td>35</td>
<td>6,200</td>
<td>536.6</td>
<td>10/1966–02/2022 (55 years)</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a – Table 7-9; Flow data from 2017-2022 updated from waterdata.usgs.gov.

1Inactive; cfs = cubic feet per second
Figure 3.8-3
USGS Gaging Stations
Stibnite Gold Project
Stibnite, ID

**BASE LAYER:** ESRI USA Topographic Basemap
**Other Data Sources:** United States Geological Survey, Perpetua, Boise National Forest, Payette National Forest

**LEGEND**
- Mine Site Water Modeling Boundary
- SGP Features *
- USGS Active Gaging Stations
- USGS Inactive Gaging Station
- Stream/River

Operating Period refers to Mine Years 1 through 16
Post-Closure refers to years after Mine Year 16

*Mine Site Components are associated with 2021 MMP

### Table: Water Quantity

#### East Fork South Fork Salmon River

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Period</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>No Action (modeled)</td>
<td>5.440 343</td>
</tr>
<tr>
<td>2022</td>
<td>No Action (modeled)</td>
<td>6.200 335</td>
</tr>
</tbody>
</table>

### Minimum Maximum Mean Flow (cfs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>10</td>
<td>783</td>
<td>50</td>
</tr>
<tr>
<td>2022</td>
<td>12.5</td>
<td>691</td>
<td>60</td>
</tr>
</tbody>
</table>

#### East Fork Salmon River

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Period</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>No Action (modeled)</td>
<td>5.440 343</td>
</tr>
<tr>
<td>2022</td>
<td>No Action (modeled)</td>
<td>6.200 335</td>
</tr>
</tbody>
</table>

### Minimum Maximum Mean Flow (cfs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>1.4</td>
<td>118</td>
<td>10</td>
</tr>
<tr>
<td>2022</td>
<td>5.8</td>
<td>340</td>
<td>31</td>
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</tbody>
</table>

#### Sugar Creek

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Period</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>No Action (modeled)</td>
<td>5.440 343</td>
</tr>
<tr>
<td>2022</td>
<td>No Action (modeled)</td>
<td>6.200 335</td>
</tr>
</tbody>
</table>

### Minimum Maximum Mean Flow (cfs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>1.4</td>
<td>118</td>
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</tr>
<tr>
<td>2022</td>
<td>5.8</td>
<td>340</td>
<td>31</td>
</tr>
</tbody>
</table>

#### Meadow Creek

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Period</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>No Action (modeled)</td>
<td>5.440 343</td>
</tr>
<tr>
<td>2022</td>
<td>No Action (modeled)</td>
<td>6.200 335</td>
</tr>
</tbody>
</table>

### Minimum Maximum Mean Flow (cfs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>1.4</td>
<td>118</td>
<td>10</td>
</tr>
<tr>
<td>2022</td>
<td>5.8</td>
<td>340</td>
<td>31</td>
</tr>
</tbody>
</table>
Figure 3.8-4
Stream Monthly Discharge
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2017)

Average stream flows from 2011-2016
USGS data also were used to derive peak flow statistics for the seven major drainages in the analysis area. Results from the peak flow analysis were summarized in the baseline study (HydroGeo 2012b) and Table 3.8-4. Peak flows were calculated for the bottom of each drainage using the USGS StreamStats program.

### Table 3.8-4  Peak Stream Flow Statistics for Drainages in the Analysis Area

<table>
<thead>
<tr>
<th>Drainage</th>
<th>1.5-year event</th>
<th>2-year event</th>
<th>2.33-year event</th>
<th>5-year event</th>
<th>10-year event</th>
<th>25-year event</th>
<th>50-year event</th>
<th>100-year event</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK1_5 (cfs)</td>
<td>83 (76-91)</td>
<td>98 (90-107)</td>
<td>105 (97-114)</td>
<td>132 (122-144)</td>
<td>152 (140-168)</td>
<td>175 (159-200)</td>
<td>191 (170-223)</td>
<td>205 (179-247)</td>
</tr>
<tr>
<td>PK2 (cfs)</td>
<td>97 (89-105)</td>
<td>104 (96-112)</td>
<td>130 (120-141)</td>
<td>149 (138-165)</td>
<td>171 (156-195)</td>
<td>186 (167-218)</td>
<td>200 (176-241)</td>
<td></td>
</tr>
<tr>
<td>PK5 (cfs)</td>
<td>229 (205-254)</td>
<td>279 (252-307)</td>
<td>301 (273-331)</td>
<td>395 (359-437)</td>
<td>466 (423-525)</td>
<td>550 (491-643)</td>
<td>608 (532-733)</td>
<td>662 (566-826)</td>
</tr>
<tr>
<td>PK10 (cfs)</td>
<td>372 (327-418)</td>
<td>465 (415-520)</td>
<td>508 (454-567)</td>
<td>693 (622-777)</td>
<td>837 (749-959)</td>
<td>1010 (888-1207)</td>
<td>1133 (973-1403)</td>
<td>1249 (1044-1606)</td>
</tr>
<tr>
<td>PK25 (cfs)</td>
<td>143 (124-162)</td>
<td>181 (160-204)</td>
<td>199 (177-224)</td>
<td>278 (247-314)</td>
<td>340 (301-393)</td>
<td>415 (361-502)</td>
<td>469 (398-589)</td>
<td>520 (429-680)</td>
</tr>
<tr>
<td>PK50 (cfs)</td>
<td>2497 (2268-2727)</td>
<td>2962 (2713-3230)</td>
<td>3175 (2911-3563)</td>
<td>4079 (3737-4491)</td>
<td>4789 (4356-5375)</td>
<td>5652 (5058-6592)</td>
<td>6273 (5521-7574)</td>
<td>6877 (5936-8617)</td>
</tr>
<tr>
<td>PK100 (cfs)</td>
<td>184 (159-212)</td>
<td>228 (203-253)</td>
<td>253 (227-280)</td>
<td>328 (292-364)</td>
<td>401 (358-454)</td>
<td>478 (427-533)</td>
<td>540 (477-617)</td>
<td>606 (532-680)</td>
</tr>
</tbody>
</table>

Source: Rio ASE 2021, Appendix C.
cfs = cubic feet per second; peak flow volume statistic reported followed by its 95 percent confidence interval in parentheses

In addition to the USGS data, streamflow data were collected in conjunction with surface water quality baseline sampling on a monthly or quarterly basis at 32 non-USGS monitoring stations (Figure 3.8-5). The monitoring points were selected at upstream and downstream locations to bracket historical and potential future mining activities in the Analysis Area (Brown and Caldwell 2017a). Table 3.8-5 provides streamflow statistics derived from baseline measurements collected between 2012 and early 2016. The mean flows calculated from this dataset for the East Fork SFSR ranged from 4.47 cfs at the farthest upstream monitoring location YP-SR-14, to 31.31 cfs at the most downstream location YP-SR-2. Note
that the baseline monitoring sites are at different locations than the USGS gaging stations, thus providing additional site-specific data proximal to historical and proposed facilities.

Table 3.8-5  Baseline Monitoring Surface Water Flow Statistics

<table>
<thead>
<tr>
<th>Monitoring Site</th>
<th>Stream</th>
<th>Min (cfs)</th>
<th>Max (cfs)</th>
<th>Mean (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>8.97</td>
<td>74.56</td>
<td>31.31</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>7.67</td>
<td>37.84</td>
<td>16.92</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>8</td>
<td>50.76</td>
<td>20.38</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>5.88</td>
<td>61.08</td>
<td>19.33</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>6.23</td>
<td>106.21</td>
<td>23.97</td>
</tr>
<tr>
<td>YP-SR-11</td>
<td>East Fork SFSR</td>
<td>3.32</td>
<td>40.67</td>
<td>10.41</td>
</tr>
<tr>
<td>YP-SR-13</td>
<td>East Fork SFSR</td>
<td>2.05</td>
<td>54.92</td>
<td>11.56</td>
</tr>
<tr>
<td>YP-SR-14</td>
<td>East Fork SFSR</td>
<td>0.48</td>
<td>22.25</td>
<td>4.47</td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>5.71</td>
<td>78.06</td>
<td>21.24</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>0.16</td>
<td>1.68</td>
<td>0.51</td>
</tr>
<tr>
<td>YP-T-7</td>
<td>Sugar Creek</td>
<td>5.25</td>
<td>34.12</td>
<td>12.51</td>
</tr>
<tr>
<td>YP-T-8A</td>
<td>Sugar Creek</td>
<td>4.61</td>
<td>77.36</td>
<td>19.27</td>
</tr>
<tr>
<td>YP-T-10</td>
<td>Midnight Creek</td>
<td>0.15</td>
<td>2.62</td>
<td>0.67</td>
</tr>
<tr>
<td>YP-T-11</td>
<td>Fiddle Creek</td>
<td>0.22</td>
<td>20.57</td>
<td>3.3</td>
</tr>
<tr>
<td>YP-T-12</td>
<td>Fiddle Creek</td>
<td>0.15</td>
<td>17.87</td>
<td>3.59</td>
</tr>
<tr>
<td>YP-T-15</td>
<td>Scout Creek</td>
<td>0.04</td>
<td>0.62</td>
<td>0.15</td>
</tr>
<tr>
<td>YP-T-21</td>
<td>Rabbit Creek</td>
<td>0.22</td>
<td>3.47</td>
<td>0.95</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>3.91</td>
<td>86.61</td>
<td>17.94</td>
</tr>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>2.78</td>
<td>76.45</td>
<td>14.86</td>
</tr>
<tr>
<td>YP-T-29</td>
<td>EFMC</td>
<td>0.78</td>
<td>24.45</td>
<td>4.69</td>
</tr>
<tr>
<td>YP-T-33</td>
<td>Meadow Creek</td>
<td>1.96</td>
<td>41.13</td>
<td>9.22</td>
</tr>
<tr>
<td>YP-T-35</td>
<td>Garnet Creek</td>
<td>0.01</td>
<td>1.16</td>
<td>0.19</td>
</tr>
<tr>
<td>YP-T-37</td>
<td>West End Creek</td>
<td>0.003</td>
<td>0.12</td>
<td>0.03</td>
</tr>
<tr>
<td>YP-T-40</td>
<td>Salt Creek</td>
<td>0.8</td>
<td>13.38</td>
<td>2.8</td>
</tr>
<tr>
<td>YP-T-41</td>
<td>Hennessy Creek</td>
<td>0.15</td>
<td>7.37</td>
<td>1.25</td>
</tr>
<tr>
<td>YP-T-42</td>
<td>Midnight Creek</td>
<td>0.12</td>
<td>3.59</td>
<td>0.99</td>
</tr>
<tr>
<td>YP-T-43</td>
<td>Meadow Creek</td>
<td>1.97</td>
<td>49</td>
<td>13.48</td>
</tr>
<tr>
<td>YP-T-44</td>
<td>Fern Creek</td>
<td>0.06</td>
<td>2.65</td>
<td>0.54</td>
</tr>
<tr>
<td>YP-T-45</td>
<td>North Fork Meadow Creek</td>
<td>0.24</td>
<td>19.01</td>
<td>3.92</td>
</tr>
<tr>
<td>YP-T-46</td>
<td>South Fork Meadow Creek</td>
<td>0.28</td>
<td>9.67</td>
<td>3.04</td>
</tr>
<tr>
<td>YP-T-48</td>
<td>Hennessy Creek</td>
<td>0.09</td>
<td>5.09</td>
<td>1</td>
</tr>
<tr>
<td>YP-T-49</td>
<td>West End Creek</td>
<td>0.37</td>
<td>1.37</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a

cfs = cubic feet per second
Figure 3.8-5
Surface Water Monitoring Locations
Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2017)
Seeps and Springs

Seeps and springs are locations where water emanates from the ground to form surface water resources aside from the perennial streams that serve to drain the Analysis Area. Depending on their site-specific conditions, flow from seeps and springs may be perennial or ephemeral and may or may not be enhanced by surface water runoff. Further, depending on site-specific characteristics, seeps and springs may provide an accessible water source for wildlife and vegetation, functioning as the water source for a GDE.

The HydroGeo hydrology field survey completed in 2012 identified 347 hydrologic seep/spring sites within the analysis area (HydroGeo 2012a). The survey identified 37 seeps, 153 seeps with wetlands, 33 springs, 117 springs with wetlands, 1 pond, 2 ponds with wetlands, 3 seep/pond/wetland complexes, and 1 reemerging creek (HydroGeo 2012a). The majority of seeps and springs were found in the glacial cirques that form the headwaters of Meadow Creek, Fiddle Creek, and Hennessy Creek (Figure 3.8-6). Monitoring of seep discharge was established at 23 sites (Figure 3.8-5) during the baseline studies to assess seep and spring contributions and for conceptualization of surficial flow in the analysis area. Mean discharge measured at the sites ranged from 0.0023 cfs at YP-AS-7 in the Meadow Creek drainage to 0.25 cfs at YP-SEBS-2 in the East Fork SFSR drainage. Table 3.8-6 provides statistics for the seep discharge.

HydroGeo (2012a, 2012b) provides the following summary of results of the 2018 spring and seep survey:

- Many of the springs or seeps at higher elevations were located near bedrock outcrops. Due to colluvial cover of the slopes, it was difficult or impossible to recognize whether the water was emanating from a bedrock source, or daylighting as unsaturated flow within the colluvium (e.g., interflow and/or throughflow).

- Springs and seeps were found in the lower Meadow Creek drainage around the spent heap leach ore disposal area.

- Most of the springs were found in alluvial or colluvial slump areas. Emerging water was often found flowing only a short distance above ground before going underground again, especially at higher elevations where snowmelt recharges the colluvial cover.

- Some of the spring and seep sites were located along road cuts. These types of springs and seeps are not naturally occurring and bear no discernible relationship to any local geologic features.

- The results of the survey indicate no clear-cut relationship between the springs and seeps and mapped geologic structures and stratigraphy.
Table 3.8-6  Baseline Monitoring Seep and Spring Discharge Statistics

<table>
<thead>
<tr>
<th>Monitoring Site</th>
<th>Drainage</th>
<th>Min (cfs)</th>
<th>Max (cfs)</th>
<th>Mean (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-AS-1</td>
<td>Sugar Creek</td>
<td>0.0003</td>
<td>0.09</td>
<td>0.01</td>
</tr>
<tr>
<td>YP-AS-2</td>
<td>Sugar Creek</td>
<td>0.03</td>
<td>0.22</td>
<td>0.08</td>
</tr>
<tr>
<td>YP-AS-3</td>
<td>East Fork SFSR</td>
<td>0.0005</td>
<td>0.03</td>
<td>0.005</td>
</tr>
<tr>
<td>YP-AS-4</td>
<td>East Fork SFSR</td>
<td>0.015</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>YP-AS-5</td>
<td>Fiddle Creek</td>
<td>NM</td>
<td>NM</td>
<td>NM</td>
</tr>
<tr>
<td>YP-AS-6</td>
<td>East Fork SFSR</td>
<td>0.0004</td>
<td>0.01</td>
<td>0.0043</td>
</tr>
<tr>
<td>YP-AS-7</td>
<td>Meadow Creek</td>
<td>0.000012</td>
<td>0.0052</td>
<td>0.0023</td>
</tr>
<tr>
<td>YP-HP-S1</td>
<td>Sugar Creek</td>
<td>0.0052</td>
<td>0.29</td>
<td>0.085</td>
</tr>
<tr>
<td>YP-M-3</td>
<td>Meadow Creek</td>
<td>0.006</td>
<td>0.75</td>
<td>0.135</td>
</tr>
<tr>
<td>YP-M-4</td>
<td>Fiddle Creek</td>
<td>NM</td>
<td>NM</td>
<td>NM</td>
</tr>
<tr>
<td>YP-S-1</td>
<td>Sugar Creek</td>
<td>0.00003</td>
<td>0.03</td>
<td>0.004</td>
</tr>
<tr>
<td>YP-S-2</td>
<td>Meadow Creek</td>
<td>0.000003</td>
<td>0.02</td>
<td>0.004</td>
</tr>
<tr>
<td>YP-S-3</td>
<td>East Fork SFSR</td>
<td>0.005</td>
<td>0.23</td>
<td>0.05</td>
</tr>
<tr>
<td>YP-S-5</td>
<td>Meadow Creek</td>
<td>0.002</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td>YP-S-6</td>
<td>Meadow Creek</td>
<td>0.0003</td>
<td>0.006</td>
<td>0.0036</td>
</tr>
<tr>
<td>YP-S-7</td>
<td>Meadow Creek</td>
<td>0.007</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>YP-S-8</td>
<td>Meadow Creek</td>
<td>0.0003</td>
<td>0.05</td>
<td>0.008</td>
</tr>
<tr>
<td>YP-S-9</td>
<td>East Fork SFSR</td>
<td>0.0007</td>
<td>0.004</td>
<td>0.002</td>
</tr>
<tr>
<td>YP-S-10</td>
<td>Meadow Creek</td>
<td>0.03</td>
<td>0.86</td>
<td>0.21</td>
</tr>
<tr>
<td>YP-SEBS-1</td>
<td>East Fork SFSR</td>
<td>0.006</td>
<td>0.07</td>
<td>0.036</td>
</tr>
<tr>
<td>YP-SEBS-2</td>
<td>East Fork SFSR</td>
<td>0.024</td>
<td>0.54</td>
<td>0.25</td>
</tr>
<tr>
<td>YP-T-17</td>
<td>East Fork SFSR</td>
<td>0.0004</td>
<td>0.12</td>
<td>0.02</td>
</tr>
<tr>
<td>YP-T-23A</td>
<td>Meadow Creek</td>
<td>0.0003</td>
<td>0.05</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a

cfs = cubic feet per second, NM = Not Measured
Figure 3.8-6
Spring and Seep Locations
Stibnite Gold Project
Stibnite, ID

Legend:
- Study Area
- Project Area

2012 Field Survey Results:
- Spring
- Spring with Wet Area
- Seep
- Seep with Wet Area
- Other (Combination)

Source:
2012 Field Survey (HydroGeo, 2012)
Data was collected July 12–August 15, 2012

2012 Field Survey Results:
- Spring
- Spring with Wet Area
- Other (Combination)

Source:
2012 Field Survey (HydroGeo, 2012)
Data was collected July 12–August 15, 2012
Waters of the United States

WOTUS are defined by 33 CFR 328.3 as: all waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; all interstate waters including interstate wetlands; all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters that are or could be used by interstate or foreign travelers for recreational or other purposes, or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce, or that are used or could be used for industrial purpose by industries in interstate commerce; all impoundments of waters otherwise defined as Waters of the U.S. under the definition; tributaries of waters identified in paragraphs (a)(1)-(4) of this section; the territorial seas; and wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1)-(6) of this section. Various related definitions, Supreme Court findings, and regulatory guidance currently affect how the definition is applied. In part, the CWA, through Part 404, requires permits before fill can be placed in jurisdictional WOTUS. WOTUS are regulated by the USACE. This section discusses non-wetland WOTUS; wetland WOTUS are described in Section 3.11.

Surface Water Rights

Within the Analysis Area, there are no federal, state, or other private surface water rights aside from two water rights held by Perpetua (Table 3.8-7). However, the Idaho Water Resource Board and the Forest Service hold minimum flow water rights downstream of the SGP on the East Fork SFSR, SFSR, and the main stem of the Salmon River.

<table>
<thead>
<tr>
<th>Water Right ID</th>
<th>Type</th>
<th>Source</th>
<th>Diversion Point</th>
<th>Priority Date</th>
<th>Beneficial Use</th>
<th>Diversion Rate (cfs)</th>
<th>Max Total Usage (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77-7293</td>
<td>Surface Water</td>
<td>Unnamed Stream (Hennessy Creek)</td>
<td>SW 1/4 of the NE 1/4, Section 3, T18N, R9E</td>
<td>4/19/1989</td>
<td>Mining</td>
<td>0.25</td>
<td>20.0</td>
</tr>
<tr>
<td>77-7122</td>
<td>Surface Water</td>
<td>East Fork SFSR</td>
<td>NW 1/4 of the NW 1/4, Section 14, T18N, R9E</td>
<td>4/16/1981</td>
<td>Storage and Mining</td>
<td>0.33</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Source: Midas Gold 2016a (Table 8-1)
cfs = cubic feet per second.

These water rights at the SGP are specific to historical use related to activities in the 1980s and 1990s. While these are valid water rights, the specific points of diversion, place of use, and beneficial use does not reflect planned SGP activities and would need to be adjusted through the transfer process, and through filing additional applications for permit. It is not necessary to record a water right for the random diversion of water for fire suppression purposes. However, water used for dust control and exploration activities requires a water right.
A review of IDWR water right records indicates that there are no downstream consumptive-use water rights on the East Fork SFSR until after the river merges with Johnson Creek (HDR 2017e). The Idaho Water Resource Board maintains minimum streamflow rights on various rivers and creeks in the state, including a location near the end of the East Fork SFSR below the confluence with Johnson Creek, which is covered under water right 77-14190. A minimum streamflow is the amount of flow necessary to preserve stream values, including protecting fish and wildlife habitat, aquatic life, navigation, transportation, recreation, water quality, or aesthetic beauty. The minimum flow varies throughout the calendar year (Table 3.8-8), with a base flow minimum of 173 cfs between October 1 and October 31 as measured on the East Fork SFSR at the confluence of the East Fork SFSR with the SFSR. Water Right 77-14190 is subordinate to future non-domestic, commercial, municipal, and industrial uses and future non-domestic, commercial, municipal, and industrial development up to 8.2 cfs.

Table 3.8-8  State of Idaho, IDWR Water Right No. 77-14190 Minimum Stream Flow

<table>
<thead>
<tr>
<th>Usage Period</th>
<th>Diversion Rate (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/1 to 8/31</td>
<td>223</td>
</tr>
<tr>
<td>9/1 to 9/30</td>
<td>179</td>
</tr>
<tr>
<td>10/1 to 10/31</td>
<td>173</td>
</tr>
<tr>
<td>11/1 to 11/30</td>
<td>214</td>
</tr>
<tr>
<td>12/1 to 12/31</td>
<td>222</td>
</tr>
<tr>
<td>1/1 to 1/31</td>
<td>254</td>
</tr>
<tr>
<td>2/1 to 2/28</td>
<td>232</td>
</tr>
<tr>
<td>3/1 to 3/31</td>
<td>291</td>
</tr>
<tr>
<td>4/1 to 4/30</td>
<td>625</td>
</tr>
<tr>
<td>5/1 to 5/31</td>
<td>1,829</td>
</tr>
<tr>
<td>6/1 to 6/30</td>
<td>2,269</td>
</tr>
<tr>
<td>7/1 to 7/31</td>
<td>590</td>
</tr>
<tr>
<td>Total Diversion</td>
<td>2,269</td>
</tr>
</tbody>
</table>

Source: HDR 2017e  
cfs = cubic feet per second.

Idaho Water Resource Board also holds a minimum streamflow water right downstream (approximately 26.4 miles from the SGP and approximately nine miles from the East Fork SFSR confluence) on the South Fork of the Salmon River (77-14174). Water Right 77-14174 is also subordinate to all future domestic, commercial, municipal, and industrial uses and future non-domestic, commercial, municipal, and industrial development up to 20.6 cfs.

The Forest Service holds two water rights on the Salmon River (75-13316 and 77-11941) below the Shoup quantification site (Shoup gage) which is upstream of the South Fork confluence. These are instream, non-consumptive water rights that maintain flows for the WSR designated segment of the Salmon River. When flows measured at the Shoup gauge are less than 13,600 cfs, the minimum in-stream flow rates provided by the water rights range from 1,200 cfs for the period of September 1 to September 15 to 9,450 cfs for the period of June 1 to June 15. The SFSR joins this segment of the main stem Salmon
River approximately 64.6 miles downstream from the SGP area. These water rights are subordinated to all water rights claims filed in the Snake River Basin Adjudication as of the effective date (September 1, 2003) of the Stipulation among the U.S., the State of Idaho, and other objectors. They also are subordinated to specified quantities of future beneficial use rights. Additional detailed information regarding these two water rights can be found in Water Right Reports (referenced by water right number) available on the IDWR website (https://idwr.idaho.gov/water-rights/).

**Surface Water Diversion and Discharge**

Under current conditions, surface water diversion within the Analysis Area is limited to water usage by Perpetua in accordance with its current surface water rights. As part of the proposed mining activity, additional surface water diversion from the East Fork SFSR is proposed from a location upstream of the proposed fish tunnel (Brown and Caldwell 2021b). New appropriation can be accommodated under the subordination amounts specified in the Idaho Water Resource Board and Forest Service minimum flow rights for future beneficial use and are most relevant to the SGP.

Storage of water is not subordinated as specified in the partial decree for the two Federal Wild and Scenic rights (Fifth Judicial District 2004) which states that “[t]hese subordinated amounts do not include storage, other than incidental storage, which is defined as storage not more than a 24-hour water supply for any beneficial use.”

There are currently no permitted wastewater discharges to surface water within the analysis area. Stormwater runoff associated with current exploration activities has been covered under the March 2021 MSGP administered by IDEQ. The 2021 MMP activity includes a treated industrial wastewater discharge and a treated residential wastewater discharge that would be permitted under the State of Idaho’s IPDES process. A discharge to Meadow Creek would be located adjacent to the TSF Buttress and discharges to East Fork SFSR would be located west of the Stibnite Worker Housing Facility and west of the Process Plant (Brown and Caldwell 2021b).

### 3.8.4.3 Groundwater

Groundwater flow in the analysis area occurs primarily in the Quaternary unconsolidated deposits in the valleys (composed of alluvium, glacial, and glaciofluvial materials), and through the unconsolidated deposits covering the mountainsides (e.g., glacial moraines, talus, colluvial, and landslide materials). The unconsolidated Quaternary deposits in the valleys form what is referred to as an alluvial aquifer. Some groundwater flow also occurs within bedrock in areas where secondary porosity including fractures and fracture zones are present and sufficiently connected to promote water flow (SPF 2017). In select locations, historical mine workings, such as adits, that penetrate the bedrock units act to promote groundwater flow in bedrock.

The unconsolidated deposits receive water from snowmelt, precipitation, and infiltration of surface runoff from upland areas, and groundwater discharge from the underlying bedrock. Groundwater discharges primarily to streams, but also supports wetlands, seeps, and springs. The water discharging from unconsolidated deposits to the surface via seeps and springs often flows only a short distance over the surface before infiltrating back into the unconsolidated materials (SPF 2017).
Groundwater Observations

Baseline characterization of groundwater, including water levels, gradients, and flow directions is based on measurements collected from 65 groundwater wells and four exploration boreholes converted to vibrating wire piezometers (Brown & Caldwell 2017). Of those 65 wells, 49 are completed in alluvium, and 16 in bedrock. Well locations are provided in Figure 3.8-7 with well completion information summarized in Table 3.8-9. Groundwater level data used for baseline characterization was collected from December 2011 through December 2019 (SPF 2017, Brown and Caldwell 2021f). Collection of groundwater level data is ongoing.

Spatially, alluvial monitoring wells characterize alluvium where it is present, primarily in the valley bottom areas (Figure 3.8-7). Bedrock monitoring wells are also located primarily in valley bottom areas where they can observe the effects of interactions between the lower flow bedrock lithologies and the higher flow alluvium (Figure 3.8-7). Most bedrock wells in the analysis area are screened within the batholith unit, with wells in the northeastern part of the project screened within the metasedimentary units (Figures 3.8-8 and 3.8-9). Tertiary intrusive rock units are interspersed within the other bedrock lithologies and are generally not specifically targeted by monitoring well completions due to their generally low permeability and small volumetric presence compared to the batholith and metasedimentary units.

Most wells and boreholes (completed in alluvium or bedrock) exhibit seasonal groundwater level fluctuations typically ranging from approximately 2 to 20 feet. The highest water levels occur at the peak of the spring runoff period (i.e., between May and July), with levels receding to a minimum by late summer or early fall. The spot measurements in these wells indicate both the seasonality and the amplitude of annual fluctuations. Continuous water level measurements also show responses to major recharge events.
Figure 3.8-7
Groundwater Monitoring Well Locations
Stibnite Gold Project
Stibnite, ID

Base Layer: USGS The National Map - 3D Elevation Program

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Other Data Sources: Perpetua; USGS NHD,
0.25
0.5
Miles
1 inch = 2,500 feet when printed at 11x17

Legend:
- Alluvial Baseline Monitoring Well
- Other Alluvial Monitoring Well/Piezometer
- Bedrock Baseline Monitoring Well
- Other Bedrock Monitoring Well/Piezometer

Project Components
- SGP Features
- Other Features
- Stream/River
Figure 3.8-8
Surface Geology
Stibnite Gold Project
Stibnite, ID

Basemap: Aerial photo, November 2011

Legend
> Project Area
> Alluvial Baseline Monitoring Wells
> Groundwater Elevation Contours
  > 20 ft contour intervals
  > Uncertain
Cross Section Line A-A'

Data Source: Brown & Caldwell 2017
Figure 3.8-9
Hydrogeologic Cross-Sections
Stibnite Gold Project
Stibnite, ID
Data Sources: Brown & Caldwell 2017

Legend:
- Mining Hill and Trenchwall Channel
- MWH (Molybdenum Sulfide Deposit)
- Sedimentary Fill
- Saliniery Sedimentary Deposits
- Sedimentary Turbidity Deposition (MWH Laps 2 and 3)
- Electric Transition Zone (MWH Layer 3)
- MWH Primarily (Intensive Geology, GEM Layer 4 and 5)

Notes:
* 13% spring 2014 data
* MWH-1, MWH-2: water levels are averages
* BEST - fall 2013 water level
* Average fall 2015 water level in MWH-1 and 2.58% feet
* MWH-1, MWH-2: not shown above the bedrock
* MWH-1, MWH-2: not shown on the section.
## Table 3.8-9 Monitoring Well Completion Details

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<th>Hydrogeologic Unit Screened</th>
<th>Water Level (feet AML)</th>
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¹ Global Position System Coordinates in feet AMSL (North and East) and decimal degrees.
² Depth to water in feet bgs (below ground surface) and feet dry.
³ Type of monitoring well or piezometer.
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Source: SPF 2017; Brown and Caldwell 2021f

<sup>1</sup>Universal Transverse Mercator (UTM) coordinates

<sup>2</sup>Screen interval depth from ground surface

<sup>3</sup>Water level depth from ground surface
Figure 3.8-10 shows water table elevation contours for the analysis area computed by the groundwater model calibrated to water levels (Brown and Caldwell 2018a, 2021b). The model calibration statistics (Brown and Caldwell 2021e) indicate that the modeled groundwater elevations compare acceptably to monitoring well water level observations which are concentrated in valley bottoms. There are fewer observation locations for comparison on the mountain side areas. The water table contours mimic the land surface topography. The contours shown indicate that the water table is present both within unconsolidated sediments (particularly in the valley alluvium), and within shallow bedrock (mainly outside of the valley bottoms).

Groundwater horizontal hydraulic gradients within the alluvial deposits range from approximately two to 10 percent and are generally consistent with gradients of adjacent streams. Gradients in shallow bedrock are similar to gradients in the alluvial deposits but are steeper on the mountain slopes outside of the valley bottoms.

Vertical hydraulic gradients were calculated using data collected from 12 well nests (pairs of alluvial and shallow bedrock wells with screens completed at different depths) and multilevel samplers and vibrating wire piezometers installed in bedrock boreholes. Upland areas exhibit strong downward gradients (e.g., MWH-B21), indicating the presence of groundwater recharge areas outside of the mountain valleys, while the valley bottoms exhibit weak upward or downward gradients (SPF 2017). The lack of strong upward gradients along the valley axis may indicate an absence of a larger scale, deeper groundwater system of a type described by Winter (1976) with recharge zones coinciding with high mountain ridges and slopes and discharge zones located in mountain valleys. Low permeability of the underlying bedrock likely prevents development of such a system in the analysis area.

Accumulated baseline groundwater level data indicate that the streams in the analysis area are primarily gaining and groundwater flow near the valley bottoms is angled (in the downstream direction) toward the gaining streams (SPF 2017).

In summary, groundwater flows follow the land surface topography, with most groundwater migrating at shallow depths down the mountain slopes and along the valley bottoms, and eventually discharging to surface streams. On a more local scale, the flow also is affected by distribution of recharge, geology, and existing anthropogenic features (e.g., mine workings).

**Hydrogeologic Units**

The major hydrogeologic units in the Analysis Area and their estimated hydraulic conductivity values are summarized in Table 3.8-10 (Brown and Caldwell 2017a, 2021e, 2021g; SPF 2017). The hydrogeology of the Analysis Area consists of basement intrusive rocks of the Idaho Batholith partially overlain by metasedimentary rocks in the eastern portion of the Analysis Area. The most common intrusive rock in the mine area is granodiorite and the metasedimentary rocks are comprised of quartzites, marbles, dolomites, and schists. Younger volcanic intrusives are located within the Idaho Batholith rocks and metasedimentary rocks, and the bedrock is overlain by alluvium, with the thickest covers (up to approximately 250 feet) located in the valley bottoms.
Figure 3.8-10
Simulated Existing Groundwater Level Contours
Stibnite Gold Project
Stibnite, ID

LEGEND
Simulated Current Groundwater Contours
- Index Contour (500 ft)
- Normal Contour (100 ft)
- Perennial Stream
- Study Area

Base Layer: ESRI World Topographic Base
Other Data Sources: Brown & Caldwell, Perpetua, USGS
Alluvial aquifer pumping tests were performed in 1989, February 2012, December 2013, and December 2019 at the Stibnite Gestrin airstrip well located close to Meadow Creek, about 2,500 feet upgradient from the Meadow Creek–East Fork SFSR confluence, to establish alluvial aquifer characteristics in areas most likely to be impacted by mine operations. In 1989, the well was pumped at a constant rate of about 114 gallons per minute (gpm) for 300 minutes. In February 2012, the well was pumped for 480 minutes at rates ranging from 46 gpm (average for first 15 minutes) to 208 gpm (average for last 100 minutes of test). Those were the preliminary tests and the results of analysis completed using the collected data were considered uncertain (Brown and Caldwell 2017a). A more comprehensive test on the Gestrin well was conducted in December 2013. During the 2013 test, the well was pumped at an average rate of about 100 gpm for almost 31 days. Groundwater levels were monitored during the 2013 test in five alluvial wells and three shallow bedrock wells. Analyzing drawdown data collected from observation wells completed in the alluvium and bedrock allowed hydraulic properties to be estimated for both formations. Hydraulic conductivities estimated from the 2013 test data are 10.2 feet/day for the alluvial aquifer and 4.5 feet/day for the shallow bedrock. These results provide documentation of groundwater productivity of the alluvial sediments and the shallow bedrock in the area of the Gestrin well (Brown and Caldwell 2017a; SPF 2017).

In December 2019, the Gestrin well was pumped for a three-day period at a rate of 60 gpm. The diminished water production from this well between 2013 and 2019 was attributed to well inefficiency, and the 2013 test results were retained as representative of the system and its responses (Brown and Caldwell 2021f). However, data from observation wells during the 2019 pump test was informative in examining the response to alluvial groundwater pumping in the broader area around the Gestrin Well.

Pump based aquifer tests of the four SGP production wells (Stibnite’s Hooterville and main camp domestic wells, Hecla’s Pioneer well, and the Stibnite Plant utility well) completed in 1994 in the alluvium of the East Fork SFSR provided transmissivity values ranging from 67 to 134 feet/2/day. Given an average aquifer thickness of 20 feet in the area of those tested wells, the calculated hydraulic conductivities range from 3.3 to 6.7 feet/day (Brown and Caldwell 2017a).

<table>
<thead>
<tr>
<th>Hydrogeologic Unit</th>
<th>Description</th>
<th>Hydraulic Conductivity Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range of Estimates from Aquifer Tests (feet per day) Geometric Mean (feet per day)</td>
</tr>
<tr>
<td>Idaho Batholith Rocks</td>
<td>Cretaceous igneous rock with dioritic to granitic composition</td>
<td>0.0003 – 6.3 0.02</td>
</tr>
<tr>
<td>Metasedimentary Rocks</td>
<td>Metamorphosed carbonate and siliciclastic rocks</td>
<td>0.02 – 5.9 0.3</td>
</tr>
<tr>
<td>Valley Fill Alluvium/Colluvium</td>
<td>Unconsolidated sedimentary deposits</td>
<td>1-100 10</td>
</tr>
</tbody>
</table>

Source: SPF 2017; Brown and Caldwell 2021g
A pump test of the new Camp Well (SPF 2017) conducted in 2012 provided hydraulic conductivity of 12 feet/day, calculated from transmissivity of 350 feet²/day and a given average thickness for the alluvial aquifer (around the Camp Well) of 30 feet.

In addition to the pumping tests, slug tests conducted in 1996 in two alluvial monitoring wells produced hydraulic conductivity estimates averaging 4.9 feet/day. Additionally, nine slug tests conducted in 2012 on wells completed in various unconsolidated materials at proposed locations for the SGP features including the Yellow Pine pit area (six tests), Hangar Flats pit area (two tests), and proposed tailings disposal area (one test) provided estimation of hydraulic conductivities ranging from 0.3 to 139 feet/day. Slug tests conducted in 2013 in eight alluvial monitoring wells allowed estimation of average and median hydraulic conductivity values of 11.3 feet/day and 7.3 feet/day, respectively. The range of measured/estimated values was 2.8 to 28 feet/day.

Overall, the results reported by the investigations (from 1989 to 2013) for the alluvial groundwater system indicate hydraulic conductivity ranging from 1 to 100 feet/day, with an average of approximately 10 feet/day (SPF 2017).

Hydraulic characteristics of the portion of the regional Idaho Batholith rocks in the Analysis Area have been assessed via 45 packer tests conducted in exploration boreholes, seven slug tests, 11 air lift or well development monitoring of bedrock monitoring well installations, plus one observation of bedrock discharge from the DMEA tunnel (Brown and Caldwell 2021g). These data represent 64 relatively localized observations of the Idaho Batholith rocks' hydraulic properties. In general, packer test results returned lower hydraulic conductivity measurements than the other test methods which tested larger subsurface intervals in boreholes. This is consistent with the interpretation that fracture flow represents the primary flow mechanism within the Batholith rocks, as smaller interval packer tests had less probability of encountering a conductive fracture.

Hydraulic conductivity measurements ranged between 0.0003 and 6.3 feet per day with a geometric mean measurement of 0.02 feet per day, indicating that bedrock conductivity is minor compared to alluvial conductivity. Measurements were laterally consistent across the mine area and generally decreased with depth in the borehole (Brown and Caldwell 2021g).

A long-term pumping test has not been completed in the deeper bedrock portions of the Idaho Batholith rocks in the Analysis Area as zones of groundwater inflow at depth sufficient to sustain a multi-day constant rate test have not been typically encountered in drillholes (Brown and Caldwell 2021g). Monitoring of shallow bedrock rock portions of the Batholith rocks during alluvial pumping tests exhibit bedrock responses to drawdown and depressurization in the overlying alluvium. Responses of bedrock wells to alluvial pumping at the Gestrin Well in 2019 indicate hydraulic conductivities between 1.2 and 4.5 feet/day in the transition zone from alluvium to shallow bedrock where bedrock fractures would be more prevalent than at depth (Brown and Caldwell 2021f).
Hydraulic characteristics of the metasedimentary rocks have been assessed via 16 packer tests conducted in exploration boreholes and six slug tests of bedrock monitoring well installations, (Brown and Caldwell 2021g). These data represent 22 localized observations of the metasedimentary units’ hydraulic properties. Unlike the Idaho Batholith rocks, packer test and slug test results yielded comparable hydraulic conductivity measurements, indicating that the overall permeability of the units is higher than in the underlying Batholith rocks.

Hydraulic conductivity measurements in the metasedimentary units ranged between 0.02 and 5.9 feet per day with a geometric mean measurement of 0.3 feet per day, confirming that the metasediment conductivity is minor compared to alluvial conductivity but more conductive than the Idaho Batholith rocks. Measurements were laterally consistent across the mine area and generally decreased with depth in the borehole (Brown and Caldwell 2021g).

**Groundwater Budget**

A groundwater budget is a basic accounting of the inflows and outflows from a hydrologic system in a specific area. Water budgets provide a means evaluate the availability and sustainability of a water resource. Under existing conditions for the Analysis Area, the predominant inflow component for the groundwater system is recharge from precipitation. The principal groundwater outflow component is discharge of groundwater to surface water along with losses to evapotranspiration in areas where vegetation is utilizing water from a groundwater aquifer.

Locally, stream elevations at most locations are slightly lower than the water table in adjacent areas, suggesting that the streams receive groundwater discharge from the alluvial aquifer. However, there are areas where the opposite is true, indicating the presence of losing stream reaches. For example, groundwater elevations suggest the following losing reaches: 1) on the East Fork SFSR between Garnet Creek and Fiddle Creek; 2) on the East Fork SFSR immediately upgradient of the Yellow Pine pit; and 3) in the lower reach of the EFMC (SPF 2017). In aggregate, there is a net groundwater discharge to streams that represents the most significant groundwater outflow from the system, balancing the input from meteoric recharge.

In a secondary outflow to stream discharge, groundwater from fractured bedrock likely contributes flow to hillside springs located above the alluvial deposits. Springs and seeps near the northerly trending faults along the east side of both upper Meadow Creek and EFMC may be related to these faults (SPF 2017).

**Groundwater Rights**

Existing groundwater rights at the SGP have been acquired by Perpetua and are described in Table 3.8-11.
Table 3.8-11  Groundwater Rights Summary

<table>
<thead>
<tr>
<th>Water Right ID</th>
<th>Type</th>
<th>Source</th>
<th>Diversion Point</th>
<th>Priority Date</th>
<th>Beneficial Use</th>
<th>Diversion Rate (cfs)</th>
<th>Max Total Usage (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77-7285</td>
<td>Groundwater</td>
<td>Well</td>
<td>SE 1/4 of the NE 1/4, Section 15, T18N, R9E</td>
<td>11/7/1988</td>
<td>Storage and Mining</td>
<td>0.50</td>
<td>30.2</td>
</tr>
<tr>
<td>77-7141</td>
<td>Groundwater</td>
<td>Well</td>
<td>SW 1/4 of the SW 1/4, Section 11, T18N, R9E</td>
<td>6/9/1981</td>
<td>Domestic</td>
<td>0.20</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Source: Midas Gold 2016a (Table 8-1)
cfs = cubic feet per second.

The existing groundwater rights are specific to historical use. While these are valid water rights, the specific points of diversion, place of use, and beneficial use does not reflect planned SGP activities and would need to be adjusted through the transfer process, and through filing additional applications for permit. These filings were initiated in December 2021.

Groundwater Production Areas

IDWR records indicate that three permitted water supply wells are located at the SGP (Figure 3.8-11). Table 3.8-12 provides a summary information about those wells (Brown and Caldwell 2017a). Anticipated project groundwater supply areas would be in the vicinity of Hangar Flats pit area south of the currently authorized points of diversion (77-7141 and 77-7285) plus in the vicinity of the Yellow Pine pit (Figure 3.8-12). The supply well locations represented on Figure 3.8-12 are preliminary in that specific locations for have not been finalized and will depend on engineering site evaluations to finalize well designs.
Figure 3.8-11
Points of Diversion for Existing Valid Water Rights

Stibnite Gold Project
Stibnite, ID
Map Date: December 2016

Data Sources: (HDR 2017)

Legend
- Perennial Stream
- Intermittent Stream
- Underground Drain
- Road
- Point of Diversion (POD) for Existing Valid Groundwater Right
- Point of Diversion (POD) for Existing Valid Surface Water Right
- Public Land Survey System (PLSS) Section Line
- Sixteenth Section
- Private Property (Midas Gold)
Figure 3.8-12
Groundwater Production Areas
Stibnite Gold Project
Stibnite, ID
(Data Sources: Brown & Caldwell 2021a)
Table 3.8-12 Permitted Water Supply Wells in the Analysis Area

<table>
<thead>
<tr>
<th>Well</th>
<th>Permit #</th>
<th>Diameter (inch)</th>
<th>Screen Depth (ft bgs)</th>
<th>Static Water Level (ft bgs)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Gestrin Airstrip permitted mining well</td>
<td>914059-862689, Tag # D0060354</td>
<td>8</td>
<td>99 to 109</td>
<td>18</td>
<td>Date of completion: 1988, re-drilled in November 2011; is owned by Perpetua; is located near the airstrip, completed in alluvium; discharge rate (production capacity) of 100 to 150 gpm.</td>
</tr>
<tr>
<td>The original temporary Camp water supply well</td>
<td>913929-862557</td>
<td>6</td>
<td>58 to 72</td>
<td>12</td>
<td>Date of completion: October 1981; was permitted in 1981 in the mine shop area (Former Man Camp Well); completed in alluvium; discharge rate (production capacity) of 30 gpm. This well has not been used since 2013.</td>
</tr>
<tr>
<td>The new camp water supply well</td>
<td>914899-863525, Tag # D0063781</td>
<td>8</td>
<td>57 to 64</td>
<td>14</td>
<td>Date of completion: 2012; is installed in alluvium on the Stibnite Road portion of the McCall Stibnite Road (County Road 50-412); discharge rate (production capacity) of 15 gpm. Brown and Caldwell (2017) state that, as of June 2017, this well has never been used, except to test the drinking water system in 2014.</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a
ft = feet, bgs = below ground surface.

Groundwater production associated with the SGP would occur in the vicinity of the proposed open pit mine operations and the housing facility (Figure 3.8-12). Most groundwater production would occur in the Hangar Flats pit area both as dewatering pumping and industrial supply well production. Additional dewatering pumping would also occur in the Yellow Pine pit area and to a lesser extent in the West End pit area. There would also be groundwater production from a well located near the worker housing facility.

### 3.9 Surface Water and Groundwater Quality

#### 3.9.1 Introduction

This section describes existing conditions related to surface water quality, groundwater quality, and geochemistry.

#### 3.9.2 Water Quality Resources Area of Analysis

The surface water quality analysis area includes streams and lakes located in the 22 sub-watersheds that encompass the SGP, access roads, transmission lines, and off-site facilities (Figure 3.9-1). Sub-
watersheds are the hydrologic sub-basins that contain smaller tributary stream systems and are defined by the USGS’s 12-digit HUCs (EnviroAtlas 2019; Seaber et al. 1987).

The analysis area for groundwater quality includes the Sugar Creek and Headwaters East Fork SFSR sub-watersheds (Figure 3.9-2), which together encompass the SGP infrastructure that is most likely to influence groundwater quality. The groundwater quality analysis area focuses on the SGP where excavation of mineralized and unmineralized subsurface materials would occur. It does not cover all components, such as off-site facilities or supporting infrastructure corridors, which are limited to surface disturbance activities that would not affect groundwater quality. Based on the hydrogeologic conceptual model for the groundwater quality analysis area, groundwater flow is primarily controlled by topography, with mountain-front recharge flowing through shallow fractured bedrock and colluvium to unconsolidated alluvial deposits, and eventually discharging from the unconsolidated deposits to streams, springs, and seeps. As such, groundwater flow divides likely coincide with the sub-watershed boundaries that define the groundwater quality analysis area (Brown and Caldwell 2018a). The point where groundwater is most likely to flow out of the analysis area is through the alluvial aquifer at the farthest downstream point in the Headwaters East Fork SFSR sub-watershed. Any groundwater leaving the analysis area through this boundary would eventually discharge to the East Fork SFSR downgradient.

The cumulative effects boundaries for water quality are coincident with the area of analysis for direct effects because other current and reasonably foreseeable future activities that could affect water quality conditions are within the same area.

3.9.3 Relevant Laws, Regulations, Policies, and Plans

Land and Resource Management Plan: Physical, social, and biological resources on National Forest System lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. National Forest Land and Resource Management Plans embody the provisions of the NFMA and guide natural resource management activities on NFS land.

In the SGP area, the Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for surface water and groundwater quality and include various objectives, guidelines, and standards for this purpose.

Federal Laws, Regulations, and Policy: Federal laws that apply to water quality include the CWA and the Safe Drinking Water Act. The EPA is responsible for enforcing the federally-mandated CWA. Section 402 of the CWA, which authorizes the National Pollutant Discharge Elimination System (NPDES) permit program, controls water pollution by regulating point sources that discharge pollutants into WOTUS. On June 5, 2018, EPA approved the IPDES Program and authorized the transfer of permitting authority to the state beginning on July 1, 2018. EPA will retain the authority to issue NPDES permits for facilities located on tribal lands and/or discharging to tribal waters.
Figure 3.9-2
Groundwater Quality Analysis Area
Stibnite Gold Project
Stibnite, ID

Base Layer: ESRI USA Topographic Basemap
Other Data Sources: Perpetua; Boise National Forest; Payette National Forest

LEGEND
Surface Water Analysis Area
Mine Site Water Modeling Boundary
Mine Site Components*

Watersheds
Upper Middle Fork Salmon (17060205)
South Fork Salmon (17060208)
Lower Middle Fork Salmon (17060206)
Stream/River

*Mine Site components are associated with all Alternatives

Note:
Subwatersheds displayed are Hydrologic Unit Code (HUC) 6th level (12-digit)
EPA’s other responsibilities under Section 404 of the CWA include promulgating and interpreting environmental criteria used in evaluating permit applications under Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material; coordinating with the USACE (the Section 404 federal permitting authority) in the review of Section 404 permit applications; and sharing responsibility with the USACE in determining the geographic scope of CWA jurisdiction. Section 311 of the CWA also gives EPA regulatory authority with regard to spill prevention, control, and countermeasure plans required for oil storage. Facilities with aboveground and underground storage tanks in excess of specific thresholds are required to develop and implement a SPCC Plan.

Under the Safe Drinking Water Act, EPA has established primary and secondary maximum contaminant levels (MCLs) to protect the public against consumption of drinking water contaminants that present a risk to human health. The MCL is the maximum allowable amount of a contaminant in drinking water that is delivered to a consumer (EPA 2018e, 2018f).

In addition, EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 constituents. EPA does not enforce these secondary MCLs. They were established as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. These constituents are not considered a risk to human health.

State and Local Policy: The IDEQ implements the CWA in Idaho and regulates waterbodies in the state under its jurisdiction to meet Idaho water quality standards that are protective of designated uses and uses that may not be designated. Table 3.9-1 lists the strictest potentially applicable surface water quality criteria used in the water quality analysis in Idaho. These standards represent a combination of human health and cold-water aquatic life criteria that provide a benchmark for evaluating baseline water quality at the mine site and predicted concentration changes resulting from the SGP alternatives.

IDEQ administers the IPDES program regulating discharges of pollutants into WOTUS under its jurisdiction. EPA approved the State's IPDES program in accordance with the Memorandum of Agreement between IDEQ and Region 10 (IDEQ and EPA 2016). Per this memorandum, EPA will oversee IDEQ administration of the IPDES program on a continuing basis for consistency with the CWA, Idaho laws and rules, and all applicable federal regulations (IDEQ and EPA 2016).

Projects that may result in a discharge to WOTUS require Water Quality Certification under Section 401 of the CWA that the discharge is consistent with the CWA and applicable water quality standards. IDEQ is the regulatory authority for Section 401 permitting in Idaho. The IDEQ must grant (with or without conditions), deny, or waive Section 401 certification for any project in Idaho that requires a federal permit or license under the CWA before the federal permit or license can be granted, including the Section 404 permit issued by the USACE. This Water Quality Certification is designed to ensure that a federally-approved project would comply with state water quality standards for surface water and any other water quality requirements under state law.

The CWA also requires the state to prepare a report listing the current condition of all state waters and those waters that are impaired and in need of a total maximum daily load. The first list is referred to as the Section 305(b) list; the second is the Section 303(d) list. Both lists are named in accordance with the
sections of the CWA where they are defined; together, and with additional supplementary information, they are known as the Integrated Report.

Impaired waters on the Section 303(d) list are simply a subset of those on the Section 305(b) list. The current applicable report is IDEQ’s 2018/2020 Integrated Report (IDEQ 2020a).

The Idaho Nonpoint Source Management Plan describes the state’s strategy for addressing nonpoint source pollution collaboratively with local, state, and federal partners, and provides guidance on evaluating and measuring success in meeting water quality goals for the state (IDEQ 2020b). IDEQ’s role in nonpoint source management as it relates to mining and natural resource extraction includes the following:

- Conduct monitoring and total maximum daily load development;
- Conduct site investigations and inspections as necessary;
- Focus on site cleanup and remediation in areas where mining activities have contaminated soils and surface water; and
- Provide technical assistance to responsible state and federal agencies and private organizations/owners as requested.

Under Idaho’s Rules for Ore Processing by Cyanidation (IDAPA 58.01.13), mining facilities that use cyanide in their mineral extraction processes are required to obtain a permit from the IDEQ. IDAPA 58.01.13 establishes procedures and requirement for the issuance and maintenance of permits to construct, operate, and close that portion of a cyanidation facility that is intended to contain, treat, or dispose of process water or process contaminated water containing cyanide. The provisions of these rules also establish requirements for water quality protection which address design, performance, construction, operation, and closure of a cyanidation facility. The rules are intended to ensure that pollutants associated with the cyanidation process are safely contained, controlled, and treated so that they do not endanger public safety or the environment, or interfere with beneficial use of waters of the state.

In addition to regulations enforced by IDEQ, the IDWR regulates stream channels under the Idaho Stream Channel Protection Act. This act requires that a Stream Channel Alteration Permit be obtained from IDWR before any type of channel alteration work, including removal and/or fill and installation of in-water or over-water structures with the potential to affect flow, within the beds and banks of a continuously flowing stream. IDWR, the USACE, and the IDL have established a joint process for activities impacting jurisdictional waterways that require review and/or approval of both the USACE and the State of Idaho. Additionally, IDWR regulates water dams (which may apply to SGP contact water storage ponds) and mine tailings impoundments.

The Idaho Ground Water Quality Rule (IDAPA 2011) establishes minimum requirements for the protection of groundwater by setting standards and beneficial uses and categorizing aquifers to be protected at different levels. The protection levels in IDAPA 58.01.11, summarized in Table 3.9-1, include both primary and secondary numerical groundwater quality standards promulgated by IDEQ to protect human health and the environment. These standards apply to in situ groundwater.
Table 3.9-1  Surface Water and Groundwater Quality Standards Used in the Water Quality Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Groundwater Quality Standard Value (^1)</th>
<th>Surface Water Quality Standard Value (^2)</th>
<th>Surface Water Standard Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>s.u.</td>
<td>6.5-8.5 S</td>
<td>6.5-9.0</td>
<td>IDAPA 58.01.02 – Aquatic Life Use</td>
</tr>
<tr>
<td>Alkalinity, Total</td>
<td>mg/L as CaCO(_3)</td>
<td>---</td>
<td>&gt;20</td>
<td>EPA Freshwater Aquatic Life Criteria</td>
</tr>
<tr>
<td>Aluminum</td>
<td>mg/L</td>
<td>0.2 S</td>
<td>0.05 t</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.006 P</td>
<td>0.0052 d</td>
<td>IDAPA 58.01.02 – Human Health</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>0.05 P</td>
<td>0.010 t</td>
<td>IDAPA 58.01.02 – Human Health</td>
</tr>
<tr>
<td>Barium</td>
<td>mg/L</td>
<td>2 P</td>
<td>2 t</td>
<td>EPA Drinking Water MCL</td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/L</td>
<td>0.004 P</td>
<td>Narrative</td>
<td>IDAPA 58.01.02</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.005 P</td>
<td>0.00033 (^3) d</td>
<td>IDAPA 58.01.02 - CCC (chronic)</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/L</td>
<td>250 S</td>
<td>230</td>
<td>EPA Freshwater Aquatic Life Criteria</td>
</tr>
<tr>
<td>Chromium, Total</td>
<td>mg/L</td>
<td>0.1 P</td>
<td>0.1 t</td>
<td>EPA Drinking Water MCL</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/L</td>
<td>1.3 P</td>
<td>0.0024 (^3) d</td>
<td>IDAPA 58.01.02 – CCC (chronic)</td>
</tr>
<tr>
<td>Cyanide, Total</td>
<td>mg/L</td>
<td>0.2 P</td>
<td>0.0039</td>
<td>IDAPA 58.01.02 – Human Health</td>
</tr>
<tr>
<td>Cyanide, WAD</td>
<td>mg/L</td>
<td>---</td>
<td>0.0052</td>
<td>IDAPA 58.01.02 - CCC (chronic)</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/L</td>
<td>0.3 S</td>
<td>0.3 t</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>4 P</td>
<td>2</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/L</td>
<td>0.015 P</td>
<td>0.0009 (^2) d</td>
<td>IDAPA 58.01.02 – CCC (chronic)</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>0.05 S</td>
<td>0.05 t</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/L</td>
<td>0.002 P</td>
<td>0.000012 (t)</td>
<td>IDAPA 58.01.02 - CCC (chronic)</td>
</tr>
<tr>
<td>Methylmercury (fish tissue)</td>
<td>mg/kg</td>
<td>---</td>
<td>0.3</td>
<td>IDAPA 58.01.02 – Human Health</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>---</td>
<td>0.024 (^2) d</td>
<td>IDAPA 58.01.02 – CCC (chronic)</td>
</tr>
<tr>
<td>Nitrate + nitrite</td>
<td>mg/L</td>
<td>10 P</td>
<td>---</td>
<td>N/A</td>
</tr>
<tr>
<td>Selenium</td>
<td>mg/L</td>
<td>0.05 P</td>
<td>0.0015 t</td>
<td>EPA Freshwater Aquatic Life Criteria</td>
</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.1 S</td>
<td>0.0007 (^2) d</td>
<td>IDAPA 58.01.02 - CMC (acute)</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>250 S</td>
<td>250</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
<td>500 S</td>
<td>500</td>
<td>EPA Secondary Drinking Water Standard</td>
</tr>
<tr>
<td>Thallium</td>
<td>mg/L</td>
<td>0.002 P</td>
<td>0.0000017 (d)</td>
<td>IDAPA 58.01.02 – Human Health</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>5 S</td>
<td>0.054 (^2) d</td>
<td>IDAPA 58.01.02 – CMC/CCC (acute/chronic)</td>
</tr>
</tbody>
</table>

Source: IDAPA 58.01.11; IDAPA 58.01.02; EPA 2018c, 2018f, 2019b

\(^1\) Groundwater standards obtained from IDAPA 58.01.11.
2 Strictest potentially applicable surface water quality standard.

3 The criteria for these metals are hardness-dependent. The values listed are based on the East Fork SFSR hardness of 40 mg/L as calcium carbonate, which represents the 5th percentile hardness during the driest four months at node YP-SR-10 (below the confluence with Meadow Creek) between April 2012 and May 2019.

4 Copper criterion was derived using the Biotic Ligand Model per guidance contained in IDEQ (2017). A conservative chronic copper standard was estimated by applying the lowest of the 10th percentile chronic criteria based on regional classifications for the Salmon River Basin, Idaho Batholith, and third order streams. Per the SGP Water Quality Management Plan (Brown and Caldwell 2020a), preliminary calculations using the Biotic Ligand Model and site-specific data have produced similar values to the standard derived using these regional classifications.

Narrative = No numeric human health standard has been established for beryllium. However, permit authorities will address beryllium in NPDES permit actions using the narrative criteria for toxics in Section 200 of IDAPA 58.01.02, which states: “Surface waters of the state shall be free from toxic substances in concentrations that impair designated beneficial uses. These substances do not include suspended sediment produced as a result of nonpoint source activities.”

s.u. = standard units; mg/L = milligrams per liter; mg/kg = milligrams per kilogram; CaCO3 = calcium carbonate; --- = Indicates no standard for this constituent; P = primary standard; S = secondary standard; d = dissolved fraction; t = total fraction.

CCC= criterion continuous concentration; CMC= criterion maximum concentration; N/A = Not Applicable.

The IDEQ is responsible for coordinating and administering groundwater quality protection programs in the state of Idaho. IDEQ also is responsible for establishing a point of compliance location, if applied for by a mine operator and pursuant to the Idaho Ground Water Quality Rule (IDAPA 58.01.11), where groundwater and surface water downgradient of mining activity must meet established water quality standards. If a point of compliance is not applied for, the mine operator must meet the ground water quality standards in ground water both within and beyond the mining area.

The EPA recommends that a human health methylmercury criteria of 0.3 mg/kg that is translated to a total-mercury concentration of 2 ng/L in surface water be utilized in the analysis. This recommendation is incorporated into the impacts analyses, but table-reported standard values utilize the 12 ng/L (0.000012 mg/L) representing the lowest concentration adopted as a standard.

The Valley County Land Use and Development Ordinances have provisions for well head protection. These regulations would likely apply to any drinking water wells installed. The well head protection regulations control the siting of drinking water wells and prevent wells and their potential capture zones from being installed near potential sources of groundwater contamination.

### 3.9.4 Affected Environment

The affected environment description for water quality is based on water quality data collected by Perpetua, their consultants, and the USGS. Surface water quality and groundwater quality baseline studies were summarized in reports by HDR (HDR 2016a, 2017f). Analytical data presented in the HDR reports were compiled from samples collected over a 4-year period between 2012 and 2016. Additional summary and analysis of the baseline study results were provided in the SGP Water Resources Summary Report (Brown and Caldwell 2017a). Since these initial baseline studies were published, two additional years of data were collected and tabulated in the SGP Water Quality Summary Report, 2012 – 2018 (Midas Gold 2019c), and data collection is ongoing. Additionally, the USGS collected a series of surface water quality samples in the study area between 2011 and 2017, with the study results and data analysis published in two separate reports (Etheridge 2015: Baldwin and Etheridge 2019). Analytical data, statistics, and trends from the USGS and SGP baseline studies were used to characterize existing surface water and groundwater quality at the mine site and are discussed later in this report.
In the Yellow Pine and Hangar Flats ore deposits, precious metals (gold and silver) typically occur in association with very fine-grained disseminated arsenical pyrite \((Fe(S,As)_{2})\), and to a lesser extent, arsenopyrite \((FeAsS)\) (SRK 2017). Antimony occurs as the mineral stibnite \((Sb_{2}As_{3})\) often as along with precious metals mineralization but in deposits that are cross-cutting and generally more confined in distribution. Base metal sulfides (e.g., zinc, copper, and lead) are rare and occur at very low concentrations, at or below typical crustal abundance levels. Various oxidized products derived from weathering of the primary sulfides are associated with the intrusive rocks, including goethite, hematite, jarosite, and scorodite, and these host precious metal mineralization in the oxidized portions of the deposits (M3 2019).

Metasediment-hosted mineralization in the West End deposit has a similar sulfide suite and geochemistry, but with higher carbonate content in the gangue and a much more diverse suite of late-stage minerals. As in the intrusive-hosted mineralization, gold is associated with very fine-grained arsenical pyrite. Antimony mineralization is generally rare in the West End deposit.

The primary intrusive and metasedimentary rock types at the mine site include alaskite, granodiorite (i.e., quartz monzonite), diorite, rhyolite, calc-silicate, carbonates (e.g., dolomite and limestone), quartzite, stibnite stock, schist, breccia, gouge, and granite (SRK 2017). The intrusive rocks associated with the Yellow Pine and Hangar Flats deposits are predominantly composed of quartz monzonite and alaskite. In contrast, the metamorphosed sedimentary rocks of the West End deposit generally consist of calc-silicate, carbonates, quartzite, and schist.

The intrusive and metasedimentary mineralization of the main ore deposits has been extensively drilled during exploration and development, as well as during past mine operations focused on the previously exploited ores. The drilled materials represent the composition of future development rock and ore, as well as historical mine wastes. Samples from these holes were characterized via multi-element total metal analyses and tested for leachable metals (SRK 2017).

Results from the multi-element testing show that arsenic, mercury, sulfur, and antimony are enriched in the Yellow Pine, Hangar Flats, and West End ore bodies. These elements are typically associated with gold deposits (Rose et al. 1979) and their enrichment in the samples reflects the natural mineralization in the area. The enrichment of arsenic, mercury, sulfur, and antimony is generally more pronounced for the ore grade material (with a gold concentration greater than approximately 0.5 gram per ton) as would be expected; however, some of the waste grade material also is enriched with respect to these constituents (SRK 2017).

### 3.9.4.1 Geology and Mineralization

The geochemistry of the mine site is influenced by both the bedrock geology (including naturally occurring mineralization) and a legacy of historical mining activity that has altered the natural environment (Baldwin and Etheridge 2019). Locally, the Yellow Pine and Hangar Flats deposits are hosted by intrusive igneous rock associated with the Atlanta Lobe of the Idaho Batholith. Both deposits are situated along the Meadow Creek Fault Zone, a generally north trending, variably dipping, but near vertical complex fault zone that can be traced from north of the main Yellow Pine deposit south 1.85 miles through the Hangar Flats deposit, and beyond (SRK 2017). The West End deposit is hosted by
metasedimentary rocks of the Stibnite roof pendant located above the Atlanta Lobe of the Idaho Batholith. Figure 3.9-3 illustrates the various lithologic units located within the SGP area (Smitherman 1985, USGS 2007).

Both intrusive igneous rocks and metasedimentary rocks in the SGP area have undergone hydrothermal alteration associated with either Cretaceous magmatic events and/or Tertiary volcanic activity. Potassic and sodic metasomatism and widespread sericitization are characteristic of the earlier hydrothermal alteration event, while silicification and lower temperature hydrothermal alteration occurred in association with tertiary volcanic activity.

### 3.9.4.2 Geochemistry of Mined Materials

Mine operations expose mineralized and altered rocks to air and water and subsequent weathering reactions. Sulfide minerals undergo oxidation reactions that may result in the generation of acidic solutions or pH-neutral metal-bearing solutions that potentially could affect surface water and groundwater resources. Ore mined by the project would be processed on site with tailings placed in a lined TSF. Development rock material generated would be placed in the TSF Buttress or backfilled into the Yellow Pine pit or Hangar Flats pit (Table 3.9-2 and Figure 3.9-4). The SGP also would expose mineralized and altered rock in the walls of the three open pits. This section provides a summary of the geochemical testing results performed to characterize the rock geochemistry of the proposed processed ore, development rock and exposed wall rock in the post-mining quarry.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>TSF Buttress</th>
<th>Hangar Flats Pit Backfill</th>
<th>Midnight Pit Backfill</th>
<th>Yellow Pine Pit Backfill</th>
<th>TSF Embankment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Rock Sources</td>
<td>Hangar Flats pit, Yellow Pine pit, West End pit</td>
<td>Yellow Pine pit, West End pit</td>
<td>West End pit</td>
<td>Hangar Flats pit, Yellow Pine pit, West End pit</td>
<td>Hangar Flats pit, Yellow Pine pit, West End pit, SODA and Hecla heap leach legacy materials</td>
</tr>
<tr>
<td>Tons (millions)</td>
<td>81</td>
<td>18</td>
<td>7</td>
<td>113</td>
<td>61</td>
</tr>
<tr>
<td>Area (acres)</td>
<td>120</td>
<td>41</td>
<td>18</td>
<td>180</td>
<td>88</td>
</tr>
<tr>
<td>Height (feet)</td>
<td>460</td>
<td>460</td>
<td>320</td>
<td>740</td>
<td>460 (First state, 245)</td>
</tr>
<tr>
<td>Steepest Grade</td>
<td>3:1</td>
<td>5:1 to 2.5:1</td>
<td>3:1 (north side), 2:1 (south side)</td>
<td>2.5:1</td>
<td>2:1</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a
Figure 3.9-3
Stibnite Mining District
Geology

Stibnite Gold Project
Stibnite, ID

Data Sources: (SRK 2021)
Figure 3.9-4
Facility Location Map
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
In addition to the development rock sources included in Table 3.9-2, advancement of the Scout Exploration Decline is expected to produce 25,000 tons of development rock, approximately 0.01 percent of the project’s total mined material. The development rock from the Scout Exploration Decline would consist of the metasedimentary lithologies of the Stibnite roof pendant most prevalent in the West End area including quartzite, carbonate and schists with diorite and quartz monzonite intrusives (SRK 2021a). The development rock from the decline would be destined for the buttress and backfill locations along with the West End pit development rock. Hence, the characterizations of the open pit mined lithologies (Table 3.9-3) are applied to the limited amount of those lithologies present in the development rock from the Scout Exploration Decline.

The geochemical characterization program for mined materials included the following analysis:

- Review of site geology and identification of the primary material types;
- Collection of drill core and coarse reject samples representative of waste rock and ore;
- Collection of tailings representative of processed ore material; and
- Static and kinetic laboratory testing of selected samples.

The following sections describe the material types that would be mined by the SGP as well as the methods and results of the geochemical characterization program.

**Mined Material Types**

Waste rock and ore materials typically are classified and tested according to the material type and the number of samples selected for geochemical testing associated with the relative percentage of each material type expected to be mined following the mine geologic block model (Table 3.9-3 and Figure 3.9-5). The term “material type” for the SGP refers to a site-specific set of rock classifications, primarily within the portion of a lithology where the mining is planned to occur (SRK 2017).

Once open pit mining concludes, the rock types exposed in the Yellow Pine and Hangar Flats pit walls would consist primarily of quartz monzonite and alaskite while the West End pit walls would consist primarily of calc-silicate, quartzite, schist, and carbonate rock types (Table 3.9-3). Backfilling the Yellow Pine and Hangar Flats pits during the closure period will yield exposed rock types above the backfill consisting primarily of quartzite, quartz monzonite, alaskite, and alluvium in the Yellow Pine pit and quartz monzonite, fault gouge, and alluvium in the Hangar Flats pit.
<table>
<thead>
<tr>
<th>Lithology</th>
<th>Waste Rock (%)</th>
<th>Pit Wall (%)</th>
<th>Pit Wall above Backfill (%)</th>
<th>ABA</th>
<th>Siderite Corrected NP</th>
<th>NAG</th>
<th>MWMP</th>
<th>HCT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yellow Pine Pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alaskite</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>19</td>
<td>16</td>
<td>6</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Quartz Monzonite</td>
<td>10</td>
<td>20</td>
<td>13</td>
<td>29</td>
<td>24</td>
<td>17</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Granite</td>
<td>&lt;1</td>
<td>2</td>
<td>-</td>
<td>18</td>
<td>16</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quartz Monzonite-Alaskite</td>
<td>40</td>
<td>32</td>
<td>26</td>
<td>47</td>
<td>33</td>
<td>25</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Calc-silicate</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quartzite</td>
<td>14</td>
<td>12</td>
<td>26</td>
<td>15</td>
<td>15</td>
<td>9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Schist</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Breccia</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>19</td>
<td>18</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Gouge</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>26</td>
<td>23</td>
<td>7</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Diorite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Alluvium</td>
<td>11</td>
<td>8</td>
<td>15</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td><strong>Hangar Flats Pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alaskite</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29</td>
<td>23</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quartz Monzonite</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>32</td>
<td>18</td>
<td>17</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Granite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quartz Monzonite-Alaskite</td>
<td>48</td>
<td>53</td>
<td>70</td>
<td>47</td>
<td>28</td>
<td>26</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Diorite</td>
<td>1</td>
<td>&lt;1</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Calc-silicate</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carbonate</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quartzite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Schist</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Breccia</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>9</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gouge</td>
<td>13</td>
<td>9</td>
<td>16</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Alluvium</td>
<td>38</td>
<td>37</td>
<td>11</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td><strong>West End Pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quartz Monzonite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>na</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Stibnite Stock</td>
<td>14</td>
<td>11</td>
<td>na</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Calc-silicate</td>
<td>15</td>
<td>14</td>
<td>na</td>
<td>29</td>
<td>13</td>
<td>20</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Carbonate</td>
<td>18</td>
<td>19</td>
<td>na</td>
<td>13</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Quartzite</td>
<td>30</td>
<td>37</td>
<td>na</td>
<td>20</td>
<td>16</td>
<td>14</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Schist</td>
<td>15</td>
<td>14</td>
<td>na</td>
<td>19</td>
<td>13</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
Lithology | Waste Rock (%) | Pit Wall (%) | Pit Wall above Backfill (%) | ABA | Siderite Corrected NP | NAG | MWMP | HCT
---|---|---|---|---|---|---|---|---
Breccia | <1 | <1 | na | 2 | 2 | - | - | -
Gouge | <1 | <1 | na | 2 | 1 | 1 | - | -
Tailings Material | - | - | | 5 | - | 5 | 5* | 7
Bailey Tunnel | - | - | | 2 | 2 | 2 | - | -
Homestake Legacy Material | - | - | | 1 | 1 | 1 | 1 | -
Totals | 440 | 315 | 223 | 63 | 29 | | | |

Source: SRK 2017, 2021a
ABA = Acid-base accounting and multi-element analyses
NP = Neutralization Potential
NAG = Net acid generation test
MWMP = Meteoric Water Mobility Procedure
HCT = Humidity Cell Test
na = not applicable; West End pit would not be backfilled
*Tailings samples were tested using a Modified Synthetic Precipitation Leaching Procedure (SPLP; EPA 1994)

**Multi-Element Analyses**

In addition to the static and kinetic test work, multi-element analyses of exploration samples were available for approximately 46,000 exploration samples collected from drill holes. Multi-element analyses quantify the concentration of metals and analyte concentrations in whole rock samples and represent the relative masses of metals available for leaching from exposed mined materials. When compared to average crustal abundance of analytes (Mason 1966), the local lithologies exhibited enriched concentrations of antimony, arsenic, mercury, and sulfur (Table 3.9-4).

**Table 3.9-4 Average Multi-Element Rock Composition**

<table>
<thead>
<tr>
<th>Material</th>
<th>Antimony (ppm)</th>
<th>Arsenic (ppm)</th>
<th>Mercury (ppm)</th>
<th>Sulfur (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crustal Abundance</td>
<td>0.2</td>
<td>1.8</td>
<td>0.08</td>
<td>0.026</td>
</tr>
<tr>
<td>Yellow Pine Development Rock</td>
<td>62</td>
<td>1,300</td>
<td>0.48</td>
<td>0.56</td>
</tr>
<tr>
<td>Yellow Pine Ore</td>
<td>1,600</td>
<td>4,200</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Hangar Flats Development Rock</td>
<td>260</td>
<td>1,200</td>
<td>1.6</td>
<td>0.35</td>
</tr>
<tr>
<td>Hangar Flats Ore</td>
<td>3,900</td>
<td>5,400</td>
<td>4.4</td>
<td>1.4</td>
</tr>
<tr>
<td>West End Development Rock</td>
<td>84</td>
<td>340</td>
<td>0.93</td>
<td>0.25</td>
</tr>
<tr>
<td>West End Ore</td>
<td>130</td>
<td>2,500</td>
<td>1.8</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Source: SRK 2017
In addition to whole rock analyses, mineralogical analyses were performed on a subset of rock samples to examine the mineral phases present (SRK 2017). Arsenic and antimony-bearing sulfide minerals such as pyrite, arsenopyrite, and stibnite were detected amongst matric silicate minerals (quartz, microcline, and albite) and carbonate minerals (ferroan dolomite, calcite, and siderite). Minor to major amounts of clay mineralization (illite, muscovite, chlorite, kaolinite, and biotite) were also observed.

**Acid Base Accounting**

Static ABA is an industry recognized method of assessing the potential for acid generation of sulfide-bearing rocks based on the acidification potential of the sulfide minerals and the neutralization potential of carbonates, aluminosilicates, and clays within the rock. The Modified Sobek Procedure (Sobek 1978) method was used, which includes both laboratory analysis and empirical calculations based on the Acidification Potential (AP) and the Neutralizing Potential (NP) (SRK 2017). The AP values are calculated based on sulfide sulfur concentrations in the rock and reported as calcium carbonate equivalents per 1,000 tons of rock. The NP values are determined using a modified Sobek protocol that includes digestion to expel carbon dioxide followed by back titration with sodium hydroxide to a pH of 8.3 and also is reported as calcium carbonate equivalents per 1,000 tons of rock. The difference NP-AP is the Net Neutralizing Potential (NNP). The ratio of NP/AP is the Net Potential Ratio (NPR). The NNP and NPR both characterize the potential for acid generation as a net potential or as a ratio of acid-neutralization to acid-generation, respectively. The ratio has become more favored for use by regulatory agencies because it provides a clearer description of relative quantities of acid producing and acid consuming constituents (MEND 1996).
Figure 3.9-5
Geochemical Sample Locations

Stibnite Gold Project
Stibnite, ID

Data Sources: (SRK 2017)
Table 3.9-5 summarizes the ABA test results by lithology of mined material.

**Table 3.9-5  Average ABA Test Results for Development Rock and Ore**

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Type</th>
<th>N</th>
<th>Paste pH (s.u.)</th>
<th>NAG pH (s.u.)</th>
<th>AGP (CaCO₃ eq/t)</th>
<th>ANP (CaCO₃ eq/t)</th>
<th>NNP (CaCO₃ eq/t)</th>
<th>NPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskite</td>
<td>Development</td>
<td>31</td>
<td>8.6</td>
<td>7.7</td>
<td>8.1</td>
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<td>113</td>
<td>106</td>
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</tbody>
</table>

Source: SRK 2017, 2021c

1NAG testing conducted on a subset of samples where acid-generating potential was uncertain based on ABA analyses.
Siderite (iron carbonate) is a mineral reported in the project deposits. The presence of siderite can result in the overestimation of neutralization potential. Therefore, a subset of samples was submitted for the Siderite Correction Method analyses and those results indicated that the correction was not required for project lithologies.

The ABA analyses indicate that while detectable sulfides are present in all the development rock and ore lithologies (aside from the alluvium), most lithologies are not prone to acid-generation as observed in the paste pH results. Ore samples typically had higher acid-generating potentials than development rock samples due to their higher sulfide concentrations.

**Net Acid Generation Analysis**

Static Net Acid Generation (NAG) tests are conducted to determine the maximum potential for acid generation. The NAG test provides a direct empirical estimate of the overall sample reactivity, including any acid generated by semi-soluble sulfate minerals along with acid generation by sulfide minerals. In this regard, the NAG test differs from the Static ABA test and thus provides another measure of the potential for acid-generation by sulfide and sulfate bearing samples from materials in the SGP lithology.

The method used for NAG testing was that summarized by Stewart et al. (2006). This method involves intensive oxidation of the sample with hydrogen peroxide, which accelerates the oxidation of sulfide and dissolution of sulfate minerals. The leachate is then titrated with sodium hydroxide in two stages (pH 4.5 and pH 7.0) to determine the NAG value. The NAG values are calculated from an equation using the titration results.

NAG testing confirmed that ores from the alaskite, quartz monzonite, granite, quartz monzonite-alaskite, and breccia lithologies had the potential for acid-generation. However, while some individual development rock samples exhibited low potential for acid-generation, the development rock tested was non-acid-generating in aggregate (SRK 2021a).

**Meteoric Water Mobility Procedure (MWMP) Results**

The MWMP test is used to evaluate the leachability of metals from mine material by a laboratory simulation of rainwater leaching in the environment. The MWMP is conducted according to standard test methods (ASTM E-2242-02 [ASTM 1996]) that involve a 24-hour single pass column leach using a ratio of 1:1 for distilled water: rock material. The resulting leachate is analyzed for metals and other analytes of interest. Because materials tested in the procedure must be crushed to a finer state than would occur in field-scale mined materials in order to accelerate reactions in the laboratory, the MWMP results provide a qualitative evaluation of potential leachability of material types. The MWMP test is best applied to oxidized materials as it does not account for changes in pH resulting from long-term oxidation reactions because it is a single pass test.
MWMP tests were run on samples collected from subsurface drill cores and on samples collected from weathered rock exposures on site (Tables 3.9-6a and 3.9-6b). Tests on core samples had circumneutral pH with low total dissolved solids (TDS) with concentrations below 280 mg/L. Effluent concentrations of aluminum, antimony, arsenic, and mercury frequently exceeded their respective most stringent water quality criteria while concentrations of other analytes were generally not detected at concentrations above their criteria (SRK 2017). Tests on weathered surface materials also had circumneutral pH with the exception of one sample of alaskite material that had an acidic pH of 3.8. Leached TDS concentrations from the weathered rock were generally higher than those from core samples ranging between 77 mg/L and 630 mg/L for non-acidic leachate and 2,300 mg/L for the acidic alaskite sample. Like the tested cores samples, effluent concentrations of antimony, arsenic, and mercury were generally above criteria. However, aluminum concentrations were low or below reported detection limits except for the acid-generating sample. This suggests that the leachable mass of aluminum is exhausted more readily in exposed rock than the leachable masses of antimony, arsenic, and mercury.

Tailings Decant Solution Chemistry

Decant solution chemistry for five samples of synthetic tailings materials representative of the different ores that would be processed during the project lifetime yielded circum-neutral to alkaline pH values between 7.2 and 9.4 (Table 3.9-7). Several constituents in the decant solutions were present at concentrations above their most stringent potentially applicable criteria including antimony, arsenic, mercury, sulfate, and TDS (SRK 2021b). Residual cyanide in the tailings was measured in two of the five tests. Constituent concentrations from Yellow Pine pit and Hangar Flats pit decant solutions were generally higher than the concentrations in the West End pit decant solution, consistent with the lower total concentrations of these analytes in the West End ore based on whole rock analyses (Table 3.9-4).
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Table 3.9-6a Average MWMP Results – Development Rock and Ore
Parameter

Units

Strictest
Potentially
Applicable
Standard

Samples

Alaskite
Core

Alaskite
Surface

Quartz
Monzonite
Core

Quartz
Monzonite
Surface

Granite
Core

Quartz
Monzonite/
Alaskite
Core

Rhyolite
Core

CalcSilicate
Core

CalcSilicate
Surface

Diorite
Core

Quartzite
Core

Quartzite
Surface

Schist
Core

Schist
Surface

3

1

6

6

1

6

2

5

1

2

2

1

2

1

Alkalinity

mg/L
CaCO3

>20

98

-

72

-

13

48

9

11

50

16

15

16

5

53

Aluminum

mg/L

0.05

0.047

20

0.054

2.7

<0.045

0.049

0.067

0.058

<0.045

0.070

0.069

<0.045

0.13

<0.045

Antimony

mg/L

0.0052

0.041

0.012

0.026

0.339

0.13

0.061

<0.0025

0.0035

0.005

0.039

0.0028

0.005

<0.0025

0.005

Arsenic

mg/L

0.01

0.25

0.2

0.37

0.91

2.6

0.49

0.0075

0.014

0.05

0.013

0.017

0.10

<0.01

0.02

Barium

mg/L

2

0.011

<0.01

<0.01

0.03

<0.01

0.011

<0.01

<0.01

<0.01

0.012

<0.01

<0.01

<0.03

<0.01

Beryllium

mg/L

-

<0.001

0.09

<0.001

0.003

<0.001

<0.001

<0.001

<0.001

<0.001

<0.001

<0.001

<0.001

<0.003

<0.001

Bismuth

mg/L

-

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.3

<0.1

Boron

mg/L

-

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.1

<0.3

<0.1

Cadmium

mg/L

0.00033

<0.001

0.002

<0.001

0.0004

<0.001

<0.001

<0.001

<0.001

<0.00015

<0.001

<0.001

<0.00015

<0.001

<0.00015

Calcium

mg/L

-

7

430

5

47

15

5

3

5

31

14

6

12

2

83

Chloride

mg/L

230

1

10

2

3

11

2

<1

2

<1

<1

3

<1

<1

<1

Chromium

mg/L

0.0106

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

<0.005

0.015

<0.005

Cobalt

mg/L

-

<0.01

0.28

<0.01

0.018

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

Copper

mg/L

0.002

<0.05

0.41

<0.05

0.032

<0.05

<0.05

<0.05

<0.05

<0.003

<0.05

<0.05

0.0042

<0.05

<0.003

Fluoride

mg/L

2

<0.1

1.2

<0.1

0.44

<0.1

0.1

<0.1

<0.1

0.15

0.12

<0.1

<0.1

<0.1

0.22

Iron

mg/L

0.3

<0.01

0.65

<0.01

3.01

<0.01

0.11

<0.01

<0.01

<0.01

0.03

<0.01

0.016

0.03

<0.01

Lead

mg/L

0.0009

<0.0025

0.002

<0.0025

0.001

<0.0025

<0.0025

<0.0025

<0.0025

<0.0007

<0.0025

<0.0025

<0.0007

<0.0025

<0.0007

Magnesium

mg/L

-

3

110

1

23

2

1

1

2

1

4

2

2

2

2

Manganese

mg/L

0.05

0.028

9.2

0.007

1.18

0.022

0.011

<0.005

0.008

<0.005

0.041

0.006

<0.005

0.015

<0.005

Mercury

mg/L

0.000012

<0.0002

<0.0001

0.00012

0.0003

0.00021

<0.0001

<0.0001

<0.0001

<0.0001

<0.0001

0.00019

<0.0001

<0.0002

<0.0001

Molybdenum

mg/L

-

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.03

<0.01

Nickel

mg/L

0.024

<0.01

0.93

<0.01

0.015

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

<0.01

Nitrate

mg/L
as N

-

<1

0.5

<1

1.52

<1

<1

<1

<1

2

<1

<1

6.3

<1

1.3

Nitrite

mg/L
as N

-

0.028

0.12

0.029

0.09

0.027

0.029

0.027

<0.025

0.030

<0.025

0.032

0.030

<0.025

0.030

pH

s.u.

6.5 – 9.0

7.0

3.8

6.8

5.2

6.8

6.7

6.8

6.8

7.9

6.9

6.8

6.8

6.6

7.4

Phosphorus

mg/L

-

<0.5

<0.5

<0.5

<0.5

<0.5

<0.5

<0.5

<0.5

<0.5

0.5

<0.5

<0.5

1.5

<0.5

Potassium

mg/L

-

2

7

1

3

3

1

1

1

5

2

1

2

2

8

Selenium

mg/L

0.0031

<0.01

0.004

<0.01

0.003

<0.005

<0.01

<0.01

<0.01

<0.002

<0.005

<0.01

<0.002

<0.01

<0.002

Silver

mg/L

0.0007

<0.005

<0.0004

<0.005

<0.0004

<0.005

<0.005

<0.005

<0.005

<0.0004

<0.005

<0.005

<0.0004

<0.005

<0.0004

Sodium

mg/L

-

2

1

1

1

1

1

1

<0.5

<0.5

3

1

<0.5

2

2

Sulfate

mg/L

250

21

1800

6

243

18

6

<1

5

31

39

2

2

<1

160

Thallium

mg/L

0.000017

<0.005

<0.0004

<0.005

<0.0004

<0.002

<0.002

<0.005

<0.002

<0.0004

<0.001

<0.005

<0.0004

<0.002

<0.0004

Stibnite Gold Project Supplemental Draft Environmental Impact Statement

3-160


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<th>Alaskite Surface</th>
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<th>Quartz Monzonite Surface</th>
<th>Granite Core</th>
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<th>Rhyolite Core</th>
<th>Calc-Silicate Core</th>
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Source: SRK 2021a
< denotes less than reported analytical detection limit

### Table 3.9-6b Continuation of Average MWMP Results – Development Rock and Ore

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<th>Carbonate Surface</th>
<th>Gouge Core</th>
<th>Gouge Surface</th>
<th>Hangar Flats Alluvium</th>
<th>Bradley Dumps Alluvium</th>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<td>mg/L</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>mg/L</td>
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<td>5</td>
<td>4</td>
<td>&lt;1</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/L</td>
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<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Cobalt</td>
<td>mg/L</td>
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<td>Magnesium</td>
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<td>Breccia Surface</td>
<td>Carbonate Core</td>
<td>Carbonate Surface</td>
<td>Gouge Core</td>
<td>Gouge Surface</td>
<td>Hangar Flats Alluvium</td>
<td>Bradley Dumps Alluvium</td>
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<td>pH</td>
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<td>Selenium</td>
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<td>Silver</td>
<td>mg/L</td>
<td>0.0007</td>
<td>&lt;0.005</td>
<td>&lt;0.0004</td>
<td>&lt;0.005</td>
<td>&lt;0.001</td>
<td>&lt;0.005</td>
<td>&lt;0.0004</td>
<td>&lt;0.0004</td>
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<tr>
<td>Sodium</td>
<td>mg/L</td>
<td>-</td>
<td>8</td>
<td>1</td>
<td>&lt;0.5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
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<td>Sulfate</td>
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<td>290</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>400</td>
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<td>20</td>
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<td>Thallium</td>
<td>mg/L</td>
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<td>&lt;0.002</td>
<td>&lt;0.0004</td>
<td>&lt;0.001</td>
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<td>&lt;0.0004</td>
<td>&lt;0.0005</td>
<td>&lt;0.0001</td>
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<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>280</td>
<td>600</td>
<td>52</td>
<td>77</td>
<td>29</td>
<td>630</td>
<td>137</td>
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<td>Vanadium</td>
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<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<td>0.013</td>
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<td>&lt;0.01</td>
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<td>Zinc</td>
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<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.035</td>
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<td>&lt;0.02</td>
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</table>

Source: SRK 2021a
< denotes less than reported analytical detection limit
This page left blank intentionally.
Table 3.9-7  Tailings Decant Solution Chemistry (mg/L)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Yellow Pine and Hangar Flats Tailings (SB100 Con 10 PP)</th>
<th>Late Yellow Pine Tailings (Con 5 combined tailings)</th>
<th>West End Sulfide Tailings (Con 11 combined tailings)</th>
<th>West End and Hangar Flats Tailings (Con 12 combined tailings)</th>
<th>West End Oxide Tailings WEV03</th>
<th>Weighted consolidation water chemistry1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion - all Mine Years</td>
<td>32%</td>
<td>21%</td>
<td>11%</td>
<td>6%</td>
<td>30%</td>
<td>100%</td>
</tr>
<tr>
<td>Proportion - last 3 years of tailings production</td>
<td>0%</td>
<td>18%</td>
<td>12%</td>
<td>3%</td>
<td>67%</td>
<td>100%</td>
</tr>
<tr>
<td>pH</td>
<td>8.38</td>
<td>7.93</td>
<td>8.38</td>
<td>8.50</td>
<td>7.24</td>
<td>7.95</td>
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<td>Alkalinity, CaCO3</td>
<td>170</td>
<td>130</td>
<td>210</td>
<td>190</td>
<td>130</td>
<td>155</td>
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<td>Ag</td>
<td>0.015</td>
<td>0.00057</td>
<td>&lt; 0.0020</td>
<td>&lt; 0.0020</td>
<td>&lt; 0.0008</td>
<td>0.0055</td>
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<td>Al</td>
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<td>&lt; 0.45</td>
<td>&lt; 0.45</td>
<td>&lt; 0.45</td>
<td>&lt; 0.25</td>
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<td>As</td>
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<td>&lt; 1.00</td>
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<td>-</td>
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<td>&lt; 0.0050</td>
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<td>Ca</td>
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<td>580</td>
<td>560</td>
<td>470</td>
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<td>Cd</td>
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<td>Cl</td>
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<tr>
<td>Cr</td>
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<td>&lt; 0.050</td>
<td>&lt; 0.050</td>
<td>&lt; 0.025</td>
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<td>Cu</td>
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<td>0.39</td>
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<td>&lt; 10.0</td>
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<td>&lt; 1.00</td>
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<td>&lt; 0.20</td>
<td>&lt; 0.10</td>
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<td>Hg</td>
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<td>Parameter</td>
<td>Yellow Pine and Hangar Flats Tailings (SB100 Con 10 PP)</td>
<td>Late Yellow Pine Tailings (Con 5 combined tailings)</td>
<td>West End Sulfide Tailings (Con 11 combined tailings)</td>
<td>West End and Hangar Flats Tailings (Con 12 combined tailings)</td>
<td>West End Oxide Tailings WEV03</td>
<td>Weighted consolidation water chemistry&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>--------------------------------------------------------</td>
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<tr>
<td>Mg</td>
<td>430</td>
<td>120</td>
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<td>&lt; 0.20</td>
<td>0.15</td>
<td>0.18</td>
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<td>Na</td>
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<td>520</td>
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<td>5700</td>
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<td>&lt; 0.050</td>
<td>-</td>
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<td>&lt; 5.00</td>
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<td>&lt; 0.0035</td>
<td>&lt; 0.0035</td>
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<td>&lt; 0.040</td>
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<td>SO4</td>
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<td>&lt; 0.050</td>
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<td>&lt; 0.050</td>
<td>-</td>
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<td>Total nitrogen, N</td>
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<td>&lt; 1.25</td>
<td>8.85</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<td>Cyanide, WAD</td>
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<td>TDS</td>
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<td>2743</td>
<td>20000</td>
<td>15000</td>
<td>3700</td>
<td>9544</td>
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</table>

All concentrations are for dissolved constituents unless otherwise noted.

<sup>1</sup> Weighted consolidation water chemistry is a weighted average of the five decant solution samples, with chemistry weighted according to the production of each tailings stream during the entire mine life. For parameters that are below detection for all five samples, the parameter was excluded from the weighted consolidation water chemistry. For parameters that have one or more value below detection, the detection limit was used in the calculation of the weighted consolidation water chemistry.

<sup>-</sup> Indicates parameter was below analytical detection limits in all samples and was not included in the model input.
**Humidity Cell Test Results**

The Phase 1 and Phase 2 HCT cells were operated for between 98 and 184 weeks to achieve stable effluent chemistry. The methodology for humidity cell testing calls for a test duration of 20 weeks. In practice, HCT cells are run until their effluent chemistries stabilize and the potential for acid-generation can be conclusively determined. The termination of each HCT test for the SGP was approved by the Forest Service once these conditions were met. Leachate from each of the HCTs was circum-neutral to moderately alkaline, with pH values ranging from 6.5 to 9.1. The effluent pH also was stable for each of the test cells, indicating that acid generation did not occur, or that the available neutralizing potential was sufficient to offset any acid generation. SRK (2017, 2021b, 2021c) also found that the consumption of neutralizing potential was slow in each of the HCT cells, with over 80 percent of the initial neutralizing potential remaining when the cells were terminated. This indicates that significant buffering capacity is still available and/or that acid generation is limited or occurs at a slow rate despite relatively high sulfide concentrations in the tested samples. These results are consistent with observations from the site. Historic waste rock and tailings have been left at the surface for decades (a duration more than 50 years longer than the proposed SGP mine life), with little evidence of acid rock drainage (SRK 2017).

Despite the finding of low acid generation potential, a few metals constituents still proved to be leachable from the HCTs under neutral to alkaline pH conditions (Table 3.9-8). A few constituents are mobile under these neutral to alkaline pH conditions, including aluminum, antimony, arsenic, manganese, and mercury, which were frequently leached at concentrations above the strictest potentially applicable surface water quality standard. In addition, sulfate, selenium, TDS, copper, cadmium, and zinc were occasionally elevated above the respective water quality criteria. Concentrations of beryllium, bismuth, boron, cadmium, chromium, cobalt, lead, lithium, molybdenum, nickel, selenium, silver, tin, titanium, and vanadium were at or below the strictest potentially applicable water quality criteria in the HCT leachates, indicating a low potential for leaching of these constituents (SRK 2020, 2021c).

**Table 3.9-8 Summary of Humidity Cell Test**

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Ending pH Range</th>
<th>Remnant Neutralizing Potential</th>
<th>Constituents with at least one analysis above the strictest potentially applicable water quality criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskite (3 tests)</td>
<td>7.2-8.0</td>
<td>&gt;80%</td>
<td>Alkalinity, aluminum, antimony, arsenic, copper, manganese, mercury, sulfate, thallium, and TDS</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test with peak arsenic concentrations of 2.2 mg/L. Other exceedances occurred sparsely, typically in the during the first 28 weeks of the tests.</td>
</tr>
<tr>
<td>Lithology</td>
<td>Ending pH Range</td>
<td>Remnant Neutralizing Potential</td>
<td>Constituents with at least one analysis above the strictest potentially applicable water quality criteria</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Quartz Monzonite / Alaskite (3 tests of composites from Hangar Flats and Yellow Pine rock types where alaskite occurs as dikes)</td>
<td>6.7-8.0</td>
<td>&gt;79%</td>
<td>Alkalinity, aluminum, antimony, arsenic, copper, lead, manganese, mercury, and nickel</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test with peak arsenic and antimony concentrations of 5.2 mg/L and 0.52 mg/L, respectively. Other exceedances occurred sparsely, typically in the during the first eight weeks of the tests.</td>
</tr>
<tr>
<td>Quartz Monzonite (4 tests)</td>
<td>7.7-8.0</td>
<td>&gt;91%</td>
<td>Alkalinity, aluminum, antimony, arsenic, lead, manganese, mercury, and zinc</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test with peak arsenic and antimony concentrations of 3.4 mg/L and 0.29 mg/L, respectively. Other exceedances occurred sparsely, typically in the during the first eight weeks of the tests.</td>
</tr>
<tr>
<td>Diorite (1 test)</td>
<td>8.3</td>
<td>95%</td>
<td>Aluminum, antimony, manganese, and sulfate</td>
<td>Effluent antimony concentrations were above standards throughout the test. Other exceedances occurred sparsely, typically in the during the first five weeks of the test.</td>
</tr>
<tr>
<td>Quartzite (1 test)</td>
<td>8.7</td>
<td>&gt;99%</td>
<td>Aluminum, antimony, arsenic, copper, mercury, selenium, silver, and thallium</td>
<td>Effluent arsenic concentrations up to 0.2 mg/L were above its standard throughout the test. Antimony concentrations were above its standard for 100 weeks of testing before decreasing to levels below the standard. Other exceedances occurred sparsely, typically in the during the first four weeks of the test.</td>
</tr>
<tr>
<td>Rhyolite (1 test)</td>
<td>8.3</td>
<td>87%</td>
<td>Aluminum, antimony, arsenic, fluoride, and mercury</td>
<td>Antimony concentrations were above its standard for 50 weeks of testing before decreasing to levels below the standard. Other exceedances occurred sparsely.</td>
</tr>
<tr>
<td>Calc-Silicate (2 tests)</td>
<td>7.7-8.0</td>
<td>&gt;97%</td>
<td>Alkalinity, aluminum, antimony, arsenic, copper, lead, manganese, mercury, selenium, sulfate, and TDS</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test with peak arsenic and antimony concentrations of 1.9 mg/L and 0.15 mg/L, respectively. Other exceedances occurred sparsely.</td>
</tr>
<tr>
<td>Schist (2 tests)</td>
<td>7.8-8.2</td>
<td>&gt;86%</td>
<td>Alkalinity, aluminum, antimony, arsenic, copper, manganese, and mercury</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test. Other exceedances occurred sparsely.</td>
</tr>
<tr>
<td>Lithology</td>
<td>Ending pH Range</td>
<td>Remnant Neutralizing Potential</td>
<td>Constituents with at least one analysis above the strictest potentially applicable water quality criteria</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Carbonate</td>
<td>8.0-8.1</td>
<td>&gt;99%</td>
<td>Aluminum, antimony, arsenic, copper, lead, mercury, and nickel</td>
<td>Effluent antimony concentrations were above its standard throughout the test while one test exhibited sustained arsenic concentrations above its standard. Aluminum concentrations were observed above its standards in approximately 20% of the analytical results. Other exceedances occurred sparsely.</td>
</tr>
<tr>
<td>Gouge</td>
<td>7.9</td>
<td>91%</td>
<td>Alkalinity, aluminum, antimony, arsenic, cadmium, manganese, and mercury</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test. Other exceedances occurred sparsely, typically in the during the first 28 weeks of the test. There were occasional detections of mineral acidity, but these were &lt;40% of effluent alkalinity concentrations.</td>
</tr>
<tr>
<td>Breccia</td>
<td>8.0</td>
<td>90%</td>
<td>Alkalinity, antimony, arsenic, manganese, mercury, and TDS</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test. Other exceedances occurred sparsely, typically in the during the first week of the test.</td>
</tr>
<tr>
<td>Granite</td>
<td>7.3</td>
<td>91%</td>
<td>Alkalinity, aluminum, antimony, arsenic, manganese, and mercury</td>
<td>Effluent arsenic and antimony concentrations were above standards throughout the test. Other exceedances occurred sparsely, typically in the during the first 16 weeks of the test.</td>
</tr>
</tbody>
</table>

HCT analytical results were utilized in developing modeling source terms for the water chemistry predictions. In the development of source terms, the initial flushes from the HCTs were not utilized (SRK 2018) because the first flush chemistries would be indicative of material leaching during the mine operating period, when leachate would be collected as contact water for water treatment or would be expected to dissipate in the near-term due to dilution and/or solubility controls. For the principal constituents of interest, antimony and arsenic, HCT concentrations from the first 12 weeks of testing were compared concentrations derived from the long-term testing. First flush antimony concentrations ranged between one half and twelve times the long-term antimony concentrations while first flush arsenic concentrations ranged between one half and five times the long-term arsenic concentrations. In aggregate, retaining first flush concentrations in the source term calculations would result in higher predicted model concentrations. However, predicted antimony and arsenic concentrations are above the strictest potentially applied water quality standard regardless of assumptions applied to first flush HCT chemistry.

**Potentially Acid-Generating Material Threshold**

The threshold developed to identify PAG material was established to be NPR = 1.5. This value falls between the MEND Prediction Manual for Drainage Chemistry from Sulfidic Geology Materials (MEND
2009) thresholds for PAG (NPR < 1) and non-PAG (NPR > 2). This value was verified through examination of the ABA, NAG, and humidity cell test data where samples with NPR > 1.5 did not yield acidic pH in their paste pH, NAG pH or humidity cell effluent. Further, none of the samples with NPR < 1.5 generated acidity when tested via kinetic tests. However, humidity cell tests of these materials also exhibited higher concentrations of calcium, magnesium, and sulfate in their effluent, suggesting that acid-generating and acid-neutralization reactions were occurring within the test sample. Therefore, the NPR = 1.5 threshold was selected to identify PAG material (SRK 2018, Figure 3-5).

3.9.4.3 Geochemical Influence of Historical Mining Wastes

Mining and mineral processing, primarily of gold, antimony, and tungsten, have occurred at and in the vicinity of the mine site intermittently since the early 1900s. Historical features at the mine property are shown on Figure 3.9-6. The types of waste generated by past mining activity include spent ore (i.e., material that has been leached or otherwise processed to recover metals) in the SODA and heap leach pads, tailings (i.e., Bradley tailings), and waste rock in the Bradley and West End dumps. These historical mining wastes have created geochemical and legacy impacts typical for this type of mining district that are part of the affected environment. The following sections describe the geochemical influence of the historical mining wastes on water quality.

Locally, concentrations of antimony, arsenic, mercury, and cyanide in surface water are potentially attributable to the geochemistry of historical mining wastes present at the mine site (URS 2000b). In the late 1990s, concentrations of antimony and arsenic in Meadow Creek were highest immediately below the historical Bradley tailings deposits in the lower Meadow Creek valley, suggesting that the Bradley tailings provide a continuous source of antimony and arsenic in Meadow Creek (URS 2000b). This conclusion also is supported by recent data collected during Perpetua’s surface water quality baseline study, which indicate that dissolved antimony concentrations in Meadow Creek increase from an average of 0.32 micrograms per liter (µg/L) at YP-T-33 above the SODA (Figures 3.9-7 and 3.9-8) to 6.1 µg/L at YP-T-27 below Keyway Marsh. Average dissolved arsenic concentrations also increase along this stretch from 1.2 µg/L at YP-T-33 to 34.8 µg/L at YP-T-27 (Midas Gold 2019c). Farther downstream in Meadow Creek and the East Fork SFSR, average dissolved arsenic concentrations vary by location (Figure 3.9-9), but average dissolved antimony concentrations continue to increase, reaching a high of 31.0 µg/L at East Fork SFSR assessment node YP-SR-4 below the Yellow Pine pit area. The increase in dissolved antimony concentrations downstream of YP-T-27 occurs due to multiple factors including seeps and springs emanating from historical mining features; metals leached from spent ore and waste rock; in situ mineralization traversed by Meadow Creek (i.e., the Hangar Flats deposit), and other naturally occurring mineralization present throughout the East Fork SFSR drainage.

Mercury concentrations are not similarly elevated by the mine tailings and waste rock, despite periodically exceeding the strictest potentially applicable surface water quality standard (Figure 3.9-10). Although elevated concentrations of mercury are observed in Sugar Creek, these concentrations have a well-documented source in the upstream Cinnabar (mercury) Mine located outside the proposed SGP mine area. Sugar Creek also traverses known mineralized occurrences (based on outcrop) along its length.
Figure 3.9-6
Past Mining and Related Activities in the Stibnite Mining District
Stibnite Gold Project
Stibnite, ID

LEGEND
— — Roads
□ Disturbance Areas
■ Underground Workings
□ Patented Claims

Base Layer: Hillshade derived from LiDAR supplied by Perpetua Gold
Other Data Sources: Perpetua Gold; Boise National Forest; Payette National Forest

Figure 3.9-6 Past Mining and Related Activities in the Stibnite Mining District Stibnite Gold Project Stibnite, ID
Base Layer: Hillshade derived from LiDAR supplied by Perpetua Gold Other Data Sources: Perpetua Gold; Boise National Forest; Payette National Forest
Figure 3.9-7
Surface Water Chemistry Monitoring Locations
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
Figure 3.9-8
Dissolved Antimony Concentrations in Surface Water
Stibnite Gold Project
Stibnite, ID
Data Sources: (HDR 2021)
Figure 3.9-9
Dissolved Arsenic Concentrations in Surface Water
Stibnite Gold Project
Stibnite, ID
Data Sources: (HDR 2017)
Figure 3.9-10
Total Mercury Concentrations in Surface Water
Stibnite Gold Project
Stibnite, ID
Data Sources: (HDR 2017)
Bradley tailings are present in both upper Meadow Creek valley and lower Meadow Creek valley, where the tailings have been covered with approximately 40 feet of waste rock, alluvial fill material, and neutralized “spent” ore material (URS 2000b). Groundwater hydrology studies have indicated that, in 1997 and 1999, the alluvial aquifer water table elevation was high enough to contact the bottom of the historical Bradley tailings deposit throughout most of the Meadow Creek valley (URS 2000b). Elevated concentrations of dissolved arsenic (over 12,000 µg/L) and dissolved antimony (over 1,000 µg/L) were associated with groundwater wells screened completely or partially in the Bradley tailings material, suggesting that the historical Bradley tailings currently present throughout the Meadow Creek valley have an adverse influence on groundwater quality within the mine site. A more recent study (Brown and Caldwell 2017a) also found elevated arsenic and antimony concentrations in groundwater near the Bradley tailings and former leach pads, with concentrations higher in the alluvial aquifer than in bedrock. The water quality of nearby seeps associated with the Bradley tailings, SODA, and Keyway Dam also was elevated in metals, an indication that historical mining features are impacting the alluvial and bedrock aquifers.

In the East Fork SFSR valley below Meadow Creek, alluvial and bedrock water quality samples show multiple locations where arsenic and antimony are elevated above applicable groundwater quality standards. Arsenic concentrations tend to be higher in the bedrock aquifer than the alluvium. The higher concentrations of arsenic in bedrock groundwater where little mining activity has occurred may reflect naturally occurring arsenic sources derived from unmined mineralized zones (Brown and Caldwell 2017a).

Historical mining activity at the mine site has contributed to the development of artificial groundwater seeps from tailings, waste rock piles, and adits. Many of these features have been present at the mine site for decades and have been sampled recently as part of baseline monitoring efforts. Natural springs and seeps also occur where bedrock faults and fractures intersect the ground surface outside the influence of tailings and historical mining features (Figures 3.9-6 and 3.9-7).

Data from the mine spoil seeps have been compared to natural seeps. The results of this comparison indicate that at least some of the metals found in the mine spoil seeps are endemic to the region, particularly antimony and arsenic, which were found to exceed the applicable water quality criteria in the majority of natural seep sites sampled (HDR 2017f).

The seeps and springs in the Bradley tailings-impacted areas of the Meadow Creek valley may transport dissolved constituents from groundwater to surface water. Sulfate levels in seeps and springs were variable and ranged from 4 to 136 mg/L, and pH values in the seep and spring water samples ranged from 6.3 to 8.1, indicating that acid rock drainage is not characteristic of the seeps and springs in the mine site area (URS 2000b). Sulfate and pH concentrations in the mine site springs and seeps were similar during the Surface Water Quality Baseline Study, with median values of 42 mg/L for sulfate and 7.2 for pH (Brown and Caldwell 2017a; HDR 2017f). Similarly, in the East Fork SFSR drainage, arsenic and antimony concentrations in seeps and springs are elevated below the Yellow Pine pit and Northwest Bradley waste rock dump, suggesting that these historical mine facilities are responsible for elevated concentrations of arsenic and antimony in discharging groundwater (URS 2000b).
3.9.4.4 Surface Water

For a discussion of the mine site surface water hydrology and the sub-watersheds that comprise the analysis area, see Section 3.8 and the companion Water Quality Specialist Report (Forest Service 2022f).

Operations Area Boundary

This section focuses on quantifying the baseline water chemistry at the 10 surface water assessment node sampling locations (Figure 3.9-7). The discussion of baseline chemistry is organized around the water quality indicators, which include pH, temperature, major cations and anions, TDS, metals, methylmercury, sediment content, and organic carbon. It should be noted that baseline water quality at the mine site is influenced by both natural mineralization and historical mining activity (Baldwin and Etheridge 2019). Locally, remnant features from historical mining include underground mine workings; multiple open pits; development rock dumps, piles, and tailings deposits; heap leach pads and spent heap leach ore piles; contaminated soils from the former mill and smelter sites; former surface water diversions, dams, townsites, and roads; and an abandoned water diversion tunnel (Midas Gold 2016a).

Major Ions, pH, and TDS

The average baseline major ion chemistry for the surface water assessment nodes is summarized in Table 3.9-9. The East Fork SFSR and Sugar Creek sampling locations each exhibit a calcium-magnesium-bicarbonate water type, meaning that calcium and magnesium are the dominant cations in solution, and bicarbonate is the dominant anion. The samples from Meadow Creek had on average a higher relative proportion of calcium and are therefore classified as calcium-bicarbonate water.

Average TDS concentrations also were consistent in the Meadow Creek and East Fork SFSR sampling locations. The average TDS ranged from 56 to 57 mg/L in the Meadow Creek samples and appears to increase downstream in the East Fork SFSR from about 53 mg/L in the farthest upstream reach (YP-SR-10) to 67 mg/L in the downstream reaches. It appears that despite the higher TDS load in Sugar Creek (116 mg/L), the creek does not appreciably contribute to TDS concentrations in the East Fork SFSR, based on the similar average TDS concentrations obtained for the East Fork SFSR sampling points located just upstream (YP-SR-4) and downstream (YP-SR-2) of the Sugar Creek confluence.

Baseline samples from Fiddle Creek exhibited a slightly different water quality signature compared to the East Fork SFSR and Meadow Creek. Although Fiddle Creek is classified as a calcium-bicarbonate water, the creek has a lower proportion of magnesium and a higher proportion of sodium compared to the other monitoring locations. It also has a lower proportion of sulfate and higher proportion of bicarbonate. Some of these differences may be due to the relatively low average TDS concentration observed in Fiddle Creek during the baseline monitoring period (36 mg/L). The low sulfate and TDS concentrations also could point to a lack of mineralized deposits and historical mining-related impacts in the Fiddle Creek drainage, and different lithologies in the catchment area, specifically calcareous rock formations.
<table>
<thead>
<tr>
<th>Sampling Point</th>
<th>Stream</th>
<th>No. Samples</th>
<th>pH</th>
<th>Hardness as CaCO₃</th>
<th>Bicarbonate as CaCO₃</th>
<th>Calcium</th>
<th>Chloride</th>
<th>Magnesium</th>
<th>Potassium</th>
<th>Sodium</th>
<th>Sulfate</th>
<th>TDS</th>
<th>Water Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>45</td>
<td>7.3</td>
<td>37.4</td>
<td>38.4</td>
<td>11.5</td>
<td>1.25</td>
<td>2.13</td>
<td>0.87</td>
<td>2.44</td>
<td>5.97</td>
<td>57</td>
<td>Calcium-bicarbonate</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>45</td>
<td>7.4</td>
<td>37.5</td>
<td>39.5</td>
<td>11.3</td>
<td>1.00</td>
<td>2.18</td>
<td>0.84</td>
<td>2.42</td>
<td>5.16</td>
<td>56</td>
<td>Calcium-bicarbonate</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>45</td>
<td>7.4</td>
<td>35.3</td>
<td>38.7</td>
<td>10.3</td>
<td>0.63</td>
<td>2.25</td>
<td>0.78</td>
<td>2.12</td>
<td>4.15</td>
<td>53</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>45</td>
<td>7.5</td>
<td>39.1</td>
<td>42.2</td>
<td>11.4</td>
<td>0.73</td>
<td>2.55</td>
<td>0.83</td>
<td>2.36</td>
<td>6.77</td>
<td>60</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>45</td>
<td>7.4</td>
<td>39.0</td>
<td>40.3</td>
<td>11.4</td>
<td>0.68</td>
<td>2.54</td>
<td>0.83</td>
<td>2.34</td>
<td>6.44</td>
<td>58</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>45</td>
<td>7.5</td>
<td>43.8</td>
<td>42.5</td>
<td>12.7</td>
<td>0.63</td>
<td>2.89</td>
<td>0.88</td>
<td>2.30</td>
<td>8.86</td>
<td>65</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>45</td>
<td>7.6</td>
<td>48.4</td>
<td>48.1</td>
<td>14.4</td>
<td>0.52</td>
<td>3.01</td>
<td>0.85</td>
<td>2.31</td>
<td>9.31</td>
<td>67</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
<tr>
<td>YP-T-11</td>
<td>Fiddle Creek</td>
<td>45</td>
<td>7.2</td>
<td>17.3</td>
<td>24.9</td>
<td>5.66</td>
<td>&lt;0.20</td>
<td>0.74</td>
<td>0.54</td>
<td>2.21</td>
<td>1.74</td>
<td>36</td>
<td>Calcium-bicarbonate</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>45</td>
<td>8.4</td>
<td>179</td>
<td>120</td>
<td>43.1</td>
<td>&lt;0.20</td>
<td>17.6</td>
<td>1.94</td>
<td>1.10</td>
<td>56.7</td>
<td>209</td>
<td>Calcium-magnesium-bicarbonate-sulfate</td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>46</td>
<td>7.7</td>
<td>54.2</td>
<td>56.1</td>
<td>16.5</td>
<td>&lt;0.20</td>
<td>3.09</td>
<td>0.76</td>
<td>2.24</td>
<td>9.00</td>
<td>116</td>
<td>Calcium-magnesium-bicarbonate</td>
</tr>
</tbody>
</table>

Source: Data obtained from Midas Gold 2019c

CaCO₃ = calcium carbonate.

Units are milligrams per liter except for pH, which is in standard units. Values in the table represent the average of sample results collected between 2012 and 2018. Average concentrations for calcium, magnesium, potassium, and sodium represent the dissolved fraction.
West End Creek stands out as having the most notably different major ion signature among the surface water assessment nodes (Figure 3.9-11). During the baseline period, West End Creek surface water exhibited a calcium-magnesium-bicarbonate-sulfate water type. With the exception of chloride and sodium, the West End Creek samples also had the highest major ion constituent concentrations among the surface water assessment nodes considered, with baseline sulfate and TDS concentrations averaging 57 and 209 mg/L, respectively. West End Creek sample point YP-T-6 is located downstream of both the upper and lower historical West End waste rock dumps; it is therefore possible that the water chemistry at this location has been influenced by the waste material, especially where the creek flows directly through historical development rock piles. Mapped metamorphic bedrock in the West End valley (including marble, quartzite, and schist) in contrast to granitic batholith rocks in the East Fork SFSR drainage also may affect the stream chemistry, as these rock types locally tend to produce higher TDS and alkalinity (SRK 2017).

Field-measured pH values for the surface water assessment nodes were generally in the range of 7 to 8 standard units. The highest average pH (8.4) was observed at West End Creek sample location YP-T-6. Elevated baseline pH measurements at this location are likely another indicator of the geochemical influence exerted by legacy waste rock material, natural mineralization, and the predominance of carbonate bedrock in the West End Creek drainage. Overall, the neutral to alkaline pH values observed in streams near the mine site show that the geochemistry of the natural mineralized deposits and the legacy mine materials is not conducive to acidic drainage.

**Constituents of Interest**

The Surface Water Quality Baseline Study (HDR 2017f) showed that most metals analyzed in mine site streams occur at concentrations that are below the strictest potentially applicable surface water quality standard. Exceptions include antimony, arsenic, and mercury. Therefore, these metals were selected as constituents of interest because of their potential to exceed regulatory standards and impact water and biological resources. Naturally occurring mineralization and historical mining activity have resulted in surface water quality impairments for these constituents (Baldwin and Etheridge 2019). As such, recent surface water baseline studies conducted by both Perpetua and USGS have attempted to characterize antimony, arsenic, and mercury concentrations in the Headwaters East Fork SFSR and Sugar Creek sub-watersheds.

Monitoring by Baldwin and Etheridge (2019) found that antimony in mine site streams primarily occurs in the dissolved phase (primarily as Sb(V); Dovick et al. 2016) with lower antimony concentrations recorded during high flow periods, suggesting a groundwater source. Figure 3.9-8 illustrates the range in dissolved antimony concentrations for stream monitoring locations sampled during the Surface Water Quality Baseline Study (HDR 2017f). Data for seeps in the Meadow Creek, East Fork SFSR, and Sugar Creek valleys also are provided on the figure for comparison. The stream and seep sample locations are organized from upstream (left) to downstream (right) on the horizontal axis of the figure. Overall, the figure depicts increasing dissolved antimony concentrations from upstream to downstream across the mine site.
Figure 3.9-11
Tri-Linear Diagram of Average Major Ion Chemistry for Surface Waters
Stibnite Gold Project
Stibnite, ID
As shown on Figure 3.9-8, average dissolved antimony concentrations are generally below the strictest potentially applicable surface water quality standard in the upper East Fork SFSR drainage. In the Meadow Creek drainage, dissolved antimony concentrations are higher, possibly due to loading from seeps associated with historical mining materials and/or the presence of natural mineralization in adjacent bedrock. The seeps in Meadow Creek valley had the highest concentrations of dissolved antimony across the site. Below the confluence with Meadow Creek, both the stream and seep sample locations in the middle East Fork SFSR drainage generally exhibited dissolved antimony concentrations above the strictest potentially applicable surface water quality standard. Exceptions included tributary sample locations associated with Fiddle Creek (YP-T-11 and YP-T-12) and Hennessy Creek (YP-T-41). In the Sugar Creek valley, which flows across historically mined areas and natural mineralization, seep samples typically contained dissolved antimony above the strictest potentially applicable water quality standard, but the surface water dissolved antimony concentrations tended to be lower due to dilution of the seep inputs. Below the confluence with Sugar Creek, the average dissolved antimony concentration in the East Fork SFSR at monitoring location YP-SR-2 was found to be 21.9 µg/L, which is above the strictest potentially applicable surface water quality standard. This concentration is within the range of average antimony values documented at upstream East Fork SFSR assessment nodes YP-SR-4, YP-SR-6, YP-SR-8, and YP-SR-10 (Table 3.9-10a and 3.9-10b).

Up to 96 percent of arsenic in the mine site drainages occurs in the dissolved phase (primarily as As(V); Dovick et al. 2016), suggesting a groundwater source similar to antimony (Baldwin and Etheridge 2019). Figure 3.9-9 illustrates the trend in dissolved arsenic concentrations for stream and seep monitoring locations sampled during the Surface Water Quality Baseline Study (HDR 2017f). Overall, the dissolved arsenic concentration data exhibit an increasing concentration trend from upstream to downstream across the mine site.

As shown on Figure 3.9-9, average dissolved arsenic concentrations are generally below the strictest potentially applicable surface water quality standard in the upper East Fork SFSR drainage. In the Meadow Creek drainage, dissolved arsenic concentrations increase where Meadow Creek flows past the SODA and former smelter site, presumably due to inputs from seeps and groundwater influenced by historical mining materials. The seeps in Meadow Creek valley had the highest concentrations of dissolved arsenic across the site. Below the confluence with Meadow Creek, both the stream and seep sample locations in the middle East Fork SFSR drainage generally exhibited dissolved arsenic concentrations above the strictest potentially applicable surface water quality standard. Exceptions included tributary sample locations associated with Fiddle Creek (YP-T-11) and Hennessy Creek (YP-T-41), both of which drain less mineralized areas. In the Sugar Creek valley, the seep samples typically contained dissolved arsenic above the strictest potentially applicable surface water quality standard, but the dissolved arsenic concentrations in stream flow tended to be lower. Below the confluence with Sugar Creek, the average dissolved arsenic concentration in the East Fork SFSR at monitoring location YP-SR-2 was found to be 44.5 µg/L, which is above the strictest potentially applicable surface water quality standard.
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Table 3.9-10a Average, Minimum, and Maximum Measured Constituent Concentrations for Surface Water Assessment Nodes

<table>
<thead>
<tr>
<th>Sampling Point</th>
<th>Stream</th>
<th>Aluminum (µg/L) Standard: 50 µg/L Avg/Min/Max</th>
<th>Ammonia, as Nitrogen (mg/L) Standard: 2.1 mg/L Avg/Min/Max</th>
<th>Antimony (µg/L) Standard: 5.2 µg/L Avg/Min/Max</th>
<th>Arsenic (µg/L) Standard: 10 µg/L Avg/Min/Max</th>
<th>Cadmium (µg/L) Standard: 0.33 µg/L Avg/Min/Max</th>
<th>Copper (µg/L) Standard: 2.4 µg/L Avg/Min/Max</th>
<th>Cyanide, Total (mg/L) Standard: 0.039 mg/L Avg/Min/Max</th>
<th>Iron (µg/L) Standard: 300 µg/L Avg/Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>12.0 4.2 25.3 NC &lt;0.05 0.053</td>
<td>6.10 2.04 16.9 NC &lt;0.02 0.05</td>
<td>34.8 11.8 60.7 NC &lt;0.02 0.02</td>
<td>0.3 0.1 0.7 NC &lt;0.027 - 0.0104</td>
<td>63.3 &lt;20 124</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>12.2 3.6 57.7 NC &lt;0.05 0.062</td>
<td>8.12 2.4 35.8 NC &lt;0.02 0.3</td>
<td>34.4 13.6 56.8 NC &lt;0.02 0.2</td>
<td>0.3 0.1 0.7 NC &lt;0.0027 0.0104</td>
<td>69.9 21 149</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>9.4 3.0 32.2 NC &lt;0.05 0.084</td>
<td>12.2 3.93 47.1 NC &lt;0.02 0.2</td>
<td>24.6 8.6 41.4 NC &lt;0.02 0.3</td>
<td>0.3 0.1 0.7 NC &lt;0.0027 0.0104</td>
<td>39.7 &lt;20 84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>9.4 3.1 25.6 NC &lt;0.05 0.065</td>
<td>16.9 5.7 61.8 NC &lt;0.02 - 0.27</td>
<td>28.1 12.3 48.7 NC 0.3</td>
<td>0.1 0.6 NC &lt;0.0027 0.0104</td>
<td>34.5 &lt;20 59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>9.8 2.6 41.0 NC &lt;0.05 &lt;0.05</td>
<td>19.3 6.37 46.9 NC &lt;0.02 0.2</td>
<td>30.6 12.6 41.4 NC &lt;0.02 0.2</td>
<td>0.1 0.5 NC &lt;0.0027 0.0104</td>
<td>35.4 22 54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>11.9 2.5 33.9 NC &lt;0.05 0.191</td>
<td>31.0 10.4 62.0 NC &lt;0.02 0.3</td>
<td>63.0 20.8 105 NC 0.3</td>
<td>0.1 0.6 NC &lt;0.0027 0.0104</td>
<td>65.3 24 187</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>14.0 2.2 111.0 NC &lt;0.05 0.09</td>
<td>21.9 6.79 38.2 NC &lt;0.02 0.2</td>
<td>44.5 14.7 71.1 NC &lt;0.02 - 0.03</td>
<td>0.2 0.1 0.6 NC &lt;0.0027 0.0128</td>
<td>40.5 &lt;21 160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-11</td>
<td>Fiddle Creek</td>
<td>15.7 4.4 45.6 NC &lt;0.05 &lt;0.05</td>
<td>0.56 0.23 1.09 NC &lt;0.02 0.2</td>
<td>1.6 0.5 2.9 NC &lt;0.02 0.2</td>
<td>0.1 0.6 NC &lt;0.0027 0.0128</td>
<td>22.3 &lt;14 40.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>4.0 3.0 6.3 NC &lt;0.05 &lt;0.05</td>
<td>10.5 5.72 13.0 NC &lt;0.02 0.3</td>
<td>79.6 45 97.3 NC &lt;0.02 0.3</td>
<td>0.9 &lt;0.1 0.9 NC &lt;0.0027</td>
<td>NC &lt;21 &lt;21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>9.0 2.0 80.2 NC &lt;0.05 &lt;0.05</td>
<td>3.41 1.25 8.64 NC &lt;0.02 - 0.32</td>
<td>13.0 6.5 22.4 NC 8.5</td>
<td>0.1 342 NC &lt;0.0027</td>
<td>21.4 &lt;21 39</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Data obtained from Midas Gold 2019c
µg/L = micrograms per liter; mg/L = milligrams per liter; ng/L = nanograms per liter.
Avg/Min/Max = sample average, minimum, and maximum.
NC = average value not calculated due to the high percentage of non-detect results.
Values represent the dissolved fraction unless otherwise noted.
Values in the table represent the average of sample results collected between 2012 and 2018. A range of values is provided for sample populations where most results were non-detect.
### Table 3.9-10b Continuation of Average, Minimum, and Maximum Measured Constituent Concentrations for Surface Water Assessment Nodes

<table>
<thead>
<tr>
<th>Sampling Point</th>
<th>Stream</th>
<th>Lead (µg/L)</th>
<th>Manganese (µg/L)</th>
<th>Mercury, Total (ng/L)</th>
<th>Mercury, Dissolved (ng/L)</th>
<th>Nitrate+Nitrite as Nitrogen (mg/L)</th>
<th>Selenium (µg/L)</th>
<th>Thallium (µg/L)</th>
<th>Zinc (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Standard: 0.9 µg/L</td>
<td>Standard: 50 µg/L</td>
<td>Standard: 12 ng/L</td>
<td>Standard: 0.15 µg/L</td>
<td>Standard: 0.017 µg/L</td>
<td>Standard: 54 µg/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>Avg</td>
<td>Min</td>
<td>Max</td>
<td>Avg</td>
<td>Min</td>
<td>Max</td>
<td>Avg</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>YP-T-27 Meadow Creek</td>
<td>&lt;0.04</td>
<td>25.6</td>
<td>4.5</td>
<td>42.7</td>
<td>2.5</td>
<td>&lt;1</td>
<td>11.8</td>
<td>1.5</td>
<td>&lt;0.6</td>
</tr>
<tr>
<td>YP-T-22 Meadow Creek</td>
<td>&lt;0.02 - 0.04</td>
<td>23.4</td>
<td>5.7</td>
<td>39.0</td>
<td>15.6</td>
<td>1.3</td>
<td>404</td>
<td>1.7</td>
<td>&lt;0.7</td>
</tr>
<tr>
<td>YP-SR-10 East Fork SFSR</td>
<td>&lt;0.04 - 0.06</td>
<td>13.1</td>
<td>3.1</td>
<td>21</td>
<td>6.1</td>
<td>2.0</td>
<td>31.5</td>
<td>2.5</td>
<td>&lt;1</td>
</tr>
<tr>
<td>YP-SR-8 East Fork SFSR</td>
<td>&lt;0.03 - 0.06</td>
<td>11.3</td>
<td>3.6</td>
<td>18.9</td>
<td>6.0</td>
<td>1.6</td>
<td>20.1</td>
<td>2.4</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>YP-SR-6 East Fork SFSR</td>
<td>&lt;0.02 - 0.04</td>
<td>8.5</td>
<td>3.5</td>
<td>15.4</td>
<td>5.6</td>
<td>1.9</td>
<td>24.7</td>
<td>2.4</td>
<td>1.4</td>
</tr>
<tr>
<td>YP-SR-11 East Fork SFSR</td>
<td>&lt;0.02 - 0.04</td>
<td>20.4</td>
<td>5.7</td>
<td>50.6</td>
<td>5.9</td>
<td>&lt;0.5</td>
<td>32.7</td>
<td>2.4</td>
<td>1.3</td>
</tr>
<tr>
<td>YP-T-11 Fiddle Creek</td>
<td>&lt;0.02 - 0.03</td>
<td>11.1</td>
<td>3.4</td>
<td>25.5</td>
<td>3.3</td>
<td>1.3</td>
<td>13.9</td>
<td>1.8</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>YP-T-9 West End Creek</td>
<td>&lt;0.02 - 0.06</td>
<td>1.1</td>
<td>&lt;1.1</td>
<td>1.6</td>
<td>3.3</td>
<td>&lt;1.0</td>
<td>13.9</td>
<td>1.8</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>YP-T-1 Sugar Creek</td>
<td>&lt;0.02 - 19.3</td>
<td>1.3</td>
<td>&lt;1.1</td>
<td>1.6</td>
<td>3.3</td>
<td>&lt;1.0</td>
<td>13.9</td>
<td>1.8</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>

Source: Data obtained from Midas Gold 2019c
µg/L = micrograms per liter; mg/L = milligrams per liter; ng/L = nanograms per liter.
Avg/Min/Max = sample average, minimum, and maximum.
NC = average value not calculated due to the high percentage of non-detect results.
Values represent the dissolved fraction unless otherwise noted.
Values in the table represent the average of sample results collected between 2012 and 2018. A range of values is provided for sample populations where most results were non-detect.
Based on data from the 10 surface water assessment nodes (Table 3.9-10a and 10b and Table 3.9-11), the average dissolved mercury concentration measured in water samples during the baseline study was calculated to range from 4 to 56 percent of the average total mercury concentration (HDR 2017f). This finding illustrates that, in contrast to antimony and arsenic, mercury primarily occurs in the particulate phase. The association with particles indicates that mercury is derived from erosion and/or re-suspension of surface material, rather than groundwater (Baldwin and Etheridge 2019).

The mean total mercury concentrations for streams and seeps across the mine site are presented on Figure 3.9-10. The figure shows that mean total mercury concentrations were generally below the water quality standard at most of the surface water sampling locations. However, many of the seep sample locations in the Meadow Creek, Middle East Fork SFSR, and Sugar Creek drainages exceeded the regulatory criterion. In contrast, a similar plot for dissolved mercury (Figure 3.9-12) shows that the mean dissolved mercury concentration is below the Idaho surface water quality standard for total recoverable mercury at the majority of locations sampled, further supporting the notion that much of the mercury in the mine site area is associated with particulates.
### Table 3.9-11  Comparison of Average Baseline Concentrations between Midas Gold and USGS Sample Locations

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>EF2</th>
<th>% Difference</th>
<th>EF3</th>
<th>% Difference</th>
<th>Sugar Creek</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-SR-10 (East Fork SFSR below Meadow Creek)</td>
<td>YP-SR-4 (East Fork SFSR above Sugar Creek)</td>
<td>YP-T-1 (Sugar Creek)</td>
<td>Sugar Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Source</td>
<td>Midas Gold*</td>
<td>USGS</td>
<td>---</td>
<td>Midas Gold*</td>
<td>USGS</td>
<td>---</td>
</tr>
<tr>
<td>No. Samples</td>
<td>45</td>
<td>28 - 40</td>
<td>---</td>
<td>45</td>
<td>31 - 39</td>
<td>---</td>
</tr>
<tr>
<td>Antimony, dissolved</td>
<td>12.2</td>
<td>10.9</td>
<td>11.3</td>
<td>31.0</td>
<td>27.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Arsenic, dissolved</td>
<td>24.6</td>
<td>23.7</td>
<td>3.7</td>
<td>63.0</td>
<td>56.5</td>
<td>10.9</td>
</tr>
<tr>
<td>Mercury, dissolved</td>
<td>0.003</td>
<td>0.004</td>
<td>46.2</td>
<td>0.002</td>
<td>0.004</td>
<td>50.0</td>
</tr>
<tr>
<td>Mercury, total</td>
<td>0.006</td>
<td>0.017</td>
<td>95.7</td>
<td>0.006</td>
<td>0.008</td>
<td>28.6</td>
</tr>
</tbody>
</table>

Source: Baldwin and Etheridge 2019; Midas Gold 2019c
* Document provided prior to February 2021 name change, therefore cited as Midas Gold.
USGS = United States Geological Survey.
Concentration units are in micrograms per liter.
Values in the table represent the average of sample results collected between 2012 and 2018 for Midas Gold samples, and between 2011 and 2017 for USGS samples.
Figure 3.9-12
Dissolved Mercury Concentrations in Surface Water

Stibnite Gold Project
Stibnite, ID

Data Sources: (HDR 2017)
The surface water assessment nodes YP-SR-10 (East Fork SFSR below Meadow Creek), YP-SR-4 (East Fork SFSR below Yellow Pine pit), and YP-T-1 (Sugar Creek above East Fork SFSR) closely correspond to sample locations EF2, EF3, and Sugar Creek monitored by the USGS (Baldwin and Etheridge 2019). A side-by-side comparison of average dissolved antimony, dissolved arsenic, and dissolved and total mercury concentrations for these sites is presented in Table 3.9-11. Data used to calculate the averages shown in the table were collected between 2011 and 2017 for the USGS locations and 2012 to 2018 for the Midas Gold sample points. Overall, the average dissolved antimony and arsenic concentrations from the two studies are in good agreement, with relative percent difference values between the means of 1.8 to 11.3 percent. Greater variability is evident between the dissolved and total mercury sample averages. The variability in mercury results may be attributable to the generally low concentration values, differing amounts of particulate matter in the total mercury samples, laboratory protocol differences between the two studies, or different runoff conditions in the non-overlapping years sampled (2011 and 2018).

Temporal variations in antimony, arsenic, and mercury concentrations can be correlated to daily mean stream flow (Baldwin and Etheridge 2019). A representative trend plot is provided on Figure 3.9-13 for downstream sampling location YP-SR-4 on the East Fork SFSR below Yellow Pine pit. The figure shows that total and dissolved antimony and arsenic concentrations are inversely correlated to streamflow and tend to be higher during low flow conditions. These findings indicate that groundwater inflows are likely the main source contributing to surface water antimony and arsenic concentrations at the mine site because groundwater discharge to the streams is relatively greater during low flow. The highest concentrations of arsenic are consistently observed during the July to March low flow period. For antimony, the highest concentrations occur near the end of the low flow period as streamflow is beginning to rise during the first flush of spring snowmelt. This first flush phenomenon has been observed at other mine sites and is attributable to the dissolution of soluble salts and the flushing of water concentrated by evaporation (Nordstrom 2009).

Conversely, mercury concentrations are positively correlated to streamflow, with the highest total mercury concentrations occurring during high flow conditions. This relationship indicates that mercury is derived from erosion and resuspension of surface material, which occurs during high flows (Baldwin and Etheridge 2019).

MeHg also was sampled by HDR as part of the Surface Water Quality Baseline Study (HDR 2017f), with additional sampling performed in 2017 and 2018 (Midas Gold 2019c). Sample results for the 10 surface water assessment nodes are provided in Table 3.9-12. Each assessment node was sampled for MeHg 26 to 27 times between 2012 and 2018, with approximately 90 percent of the sample results reported below the method detection limit (<0.1 ng/L). The range of observed MeHg values varied between a minimum of <0.1 ng/L (all sites) to a maximum of 0.64 ng/L (Sugar Creek). Mean MeHg values (calculated using the method detection limit for non-detect results) were at or just above the 0.1 ng/L detection limit.
Table 3.9-12 Baseline Methylmercury Concentrations for Surface Water Assessment/Prediction Nodes

<table>
<thead>
<tr>
<th>Sampling Point</th>
<th>Stream</th>
<th>No. Samples</th>
<th>Percent Non-Detects</th>
<th>Average MeHg (ng/L)</th>
<th>Minimum MeHg (ng/L)</th>
<th>Maximum MeHg (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>26</td>
<td>96</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.13</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>26</td>
<td>89</td>
<td>0.11</td>
<td>&lt;0.1</td>
<td>0.18</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>26</td>
<td>89</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.17</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>26</td>
<td>100</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>26</td>
<td>92</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.20</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>26</td>
<td>96</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.11</td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>26</td>
<td>81</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.15</td>
</tr>
<tr>
<td>YP-T-11</td>
<td>Fiddle Creek</td>
<td>26</td>
<td>89</td>
<td>0.11</td>
<td>&lt;0.1</td>
<td>0.35</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>27</td>
<td>96</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>27</td>
<td>67</td>
<td>0.14</td>
<td>&lt;0.1</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Source: Data obtained from Midas Gold 2019c
MeHg = methylmercury.
ng/L = nanograms per liter.
Min = sample minimum.
Max = sample maximum.
Values in the table were compiled from sample results collected between 2012 and 2018.

To provide context for the mine site MeHg values, the baseline concentration ranges in Table 3.9-12 were compared to summary statistics from a USGS study of MeHg in U.S. streams (USGS 2009). In this study, the USGS found no statistical difference in surface water MeHg concentrations between previously mined and unmined stream basins. Stream MeHg concentrations across all sites sampled during the study were found to range from <0.010 ng/L to 4.11 ng/L, with a mean concentration of 0.19 ng/L. In most cases, the maximum MeHg concentrations observed in the mine site assessment nodes were less than this nationwide average. Exceptions include the East Fork SFSR above the Yellow Pine area at YP-SR-6 (maximum concentration of 0.20 ng/L), Fiddle Creek (maximum concentration of 0.35 ng/L), and Sugar Creek (maximum concentration of 0.64 ng/L). However, even at Sugar Creek, which has a well-documented upstream source of mercury from the former Cinnabar Mine, MeHg was not detected in 67 percent of the samples collected. The range of results from the Surface Water Quality Baseline Study (HDR 2017f) and subsequent sampling suggests that MeHg concentrations in SGP site streams are not appreciably different from those reported by the USGS nationwide study, and that historical mining activity in the analysis area has not increased MeHg concentrations above those observed at similar reference locations throughout the U.S.

This finding is important because MeHg is present at elevated concentrations in several mine site seeps, as summarized in Table 3.9-13. The calculated means for the seep samples range from <0.1 ng/L to 0.93 ng/L at Smelter Flats Seep (YP-S-5). Maximum MeHg values for the seeps also tend to be higher, reaching 6.6 ng/L at the Smelter Flats Seep (YP-S-5). Despite these relatively high concentrations, the mine site seeps do not appear to significantly influence surface water MeHg levels (e.g., loading), either due to the low seep flow rates compared to surface water flows.
Figure 3.9-13
Average Daily Flow Rates Compared to Antimony, Arsenic, & Mercury Concentrations at a Surface Water Location Downstream of Historical Mine Activity (YP-SR-4)
Stibnite Gold Project
Stibnite, ID
Data Sources: (HDR 2017)
Table 3.9-13  Methylmercury Concentrations at Seep Sampling Locations

<table>
<thead>
<tr>
<th>Seep Location</th>
<th>Description</th>
<th>No. Samples</th>
<th>Percent Non-Detects</th>
<th>Mean MeHg (ng/L)</th>
<th>Maximum MeHg (ng/L)</th>
<th>MeHg Standard Deviation (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-S-2</td>
<td>Fault seep above workings</td>
<td>7</td>
<td>14</td>
<td>0.18</td>
<td>0.35</td>
<td>0.09</td>
</tr>
<tr>
<td>YP-S-3</td>
<td>Garnet Pit Seep</td>
<td>20</td>
<td>85</td>
<td>&lt;0.1</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td>YP-S-5</td>
<td>Smelter Flats Seep</td>
<td>8</td>
<td>75</td>
<td>0.93</td>
<td>6.6</td>
<td>2.29</td>
</tr>
<tr>
<td>YP-S-6</td>
<td>Adjacent to Keyway Marsh</td>
<td>20</td>
<td>30</td>
<td>0.30</td>
<td>1.0</td>
<td>0.23</td>
</tr>
<tr>
<td>YP-S-7</td>
<td>East side of SODA berm, adjacent to large marsh east of SODA on Hangar Flats</td>
<td>23</td>
<td>57</td>
<td>0.16</td>
<td>0.6</td>
<td>0.13</td>
</tr>
<tr>
<td>YP-S-8</td>
<td>East side of SODA berm, adjacent to large marsh east of SODA on Hangar Flats</td>
<td>24</td>
<td>88</td>
<td>0.35</td>
<td>5.9</td>
<td>1.18</td>
</tr>
<tr>
<td>YP-S-10</td>
<td>Keyway Marsh outlet</td>
<td>25</td>
<td>80</td>
<td>0.11</td>
<td>0.2</td>
<td>0.03</td>
</tr>
<tr>
<td>YP-AS-7</td>
<td>The Meadow Creek Mine adit seep</td>
<td>15</td>
<td>33</td>
<td>0.32</td>
<td>1.6</td>
<td>0.41</td>
</tr>
<tr>
<td>YP-T-23a</td>
<td>Heap leach seep southwest corner of the heap leach pile on Hangar Flats</td>
<td>13</td>
<td>85</td>
<td>0.12</td>
<td>0.3</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Source: Midas Gold 2019c  
ng/L = nanograms per liter.  
MeHg = methylmercury.  
SODA = spent heap leach ore disposal area.

Other constituents that occur in mine development rock or may be used in ore processing include aluminum, cadmium, copper, total cyanide, iron, lead, manganese, selenium, thallium, and zinc. Baseline concentrations of these constituents measured at the 10 surface water assessment nodes are provided in Table 3.9-10. The table also includes the minimum and maximum concentrations measured for each constituent to illustrate the range of values reported during the baseline study.

**Sediment**

Wildfires in the past have burned much of the forested area at the SGP and vicinity, resulting in increased erosion from the burned areas. In addition, the failure of a water dam on EFMC in 1965 caused extensive erosion both upstream and downstream of the former dam, with deposition of eroded sediment in Meadow Creek and transport of this sediment into the East Fork SFSR continuing to occur.

The ongoing erosion and sediment transport affect the turbidity and Total Suspended Solids (TSS) content of surface water. The dynamics and relationships between turbidity and TSS are functions of watershed-specific factors; but in general, the more TSS in the water, the murkier it appears and the higher the turbidity. **Table 3.9-14** and **Table 3.9-15** provide the TSS (in mg/L) and turbidity (in Nephelometric Turbidity Units, or NTUs), respectively, for the 10 surface water assessment nodes. As shown in the tables, while concentrations of TSS and turbidity are typically low during some months
under existing conditions, seasonal variations occur, and concentrations reach moderate to high levels during high flow periods.

An overview of sediment transport at the mine site also is provided in Etheridge (2015). This study found that much of the sediment entering the East Fork SF SR was derived from Sugar Creek, Meadow Creek, and EFMC (i.e., Blowout Creek). The Meadow Creek reach contributes more sediment than Sugar Creek, but most of the sediment load discharged from the Meadow Creek reach is deposited in the Yellow Pine pit lake (Etheridge 2015). Load modeling by Etheridge (2015) also showed that about 90 percent of coarse-grained sediment derived from upgradient is deposited in the Yellow Pine pit, but over 80 percent of the fine-grained sediment (<0.0625 millimeter in diameter) entering the pit lake passes through and is transported downstream. Thus, the Yellow Pine pit is an effective sediment trap for coarse-grained particles but does not have a long enough residence time to deposit the majority of the fine-grained sediment load.

**Organic Carbon**

No samples were analyzed for organic carbon during the Surface Water Quality Baseline Study (HDR 2017f). However, a previous study by Holloway et al. (2017) found relatively low dissolved organic carbon concentrations (1.1 to 1.7 mg/L) in the East Fork SF SR, Meadow Creek, and Sugar Creek. The dissolved organic carbon concentrations in a watershed can be correlated to vegetation density, vegetation type, and soil composition, with higher vegetation densities and organic-rich soils resulting in higher levels of organic carbon (Camino-Serrano et al. 2014; Larsen et al. 2011; Mzobe et al. 2018). Thus, dissolved organic carbon concentrations are expected to be low in the SGP drainage area containing poorly developed mineral soils and sparse vegetation.

**Temperature**

Stream temperature criteria have been established for chinook salmon, steelhead, and bull trout in the Payette Forest Plan as amended (Forest Service 2003a). IDEQ also has published thermal criteria for salmonid species that vary based on the aquatic life classification of a water body (e.g., warm water aquatic life, cold water aquatic life, salmonid spawning, etc.) (IDEQ 2019c). The IDEQ standards include requirements for Maximum Daily Maximum Temperature, Maximum Weekly Maximum Temperature, and Maximum Daily Average Temperature.

Establishing existing surface water temperature conditions at the SGP was important to provide a baseline dataset for comparing future temperature changes caused by the action alternatives. Two methods for establishing baseline temperatures were used: monthly grab samples and 15-minute temperature measurements. Temperature ranges from both datasets are discussed below; however, the 15-minute temperature measurements are believed to provide a more accurate representation of diurnal temperature variability for comparison to thermal criteria.

A summary of monthly grab sampling temperature statistics is provided in Table 3.9-16 for the surface water assessment nodes. The data and statistics shown in the table were compiled from the Surface Water Quality Baseline Study (HDR 2017f). A review of the monthly temperature statistics indicates that summer monthly stream temperatures are typically highest in July and August, with July temperatures...
ranging from a low of 6.8 degrees Celsius (approximately 44 degrees Fahrenheit) at West End Creek (YP-T-6) to a high of 17.8 degrees Celsius (approximately 64 degrees Fahrenheit) at the East Fork SFSR above Yellow Pine pit (YP-SR-6). Average monthly fall temperatures are highest in September, ranging from 6.7 degrees Celsius (approximately 44 degrees Fahrenheit) at West End Creek (YP-T-6) to 12.7 degrees Celsius (approximately 55 degrees Fahrenheit) at Meadow Creek near the SODA (YP-T-22).

For comparison to the monthly statistics, a graphical depiction of 15-minute temperature measurements is provided for the two-week periods centered on August 1 (Figure 3.9-14) and September 21 (Figure 3.9-15). These dates approximately coincide with the average timing of maximum summer and fall stream temperatures in the SGP area.

The 15-minute temperature data used in the water quality evaluation spans a period of record extending from 2012 through 2017. During this timeframe, 2016 was found to be the year with the warmest summer stream temperatures (Figure 3.9-14). The maximum summer temperatures in 2016 occurred on July 29, slightly before the average date of August 1. Observed conditions during the weekly periods immediately before and after July 29, 2016, therefore represent the period of low-flow, maximum, weekly summer temperatures. The range of observed temperatures across the mine site during this two-week period in 2016 was 7.2 to 19.6 degrees Celsius (approximately 45 to 67 degrees Fahrenheit) (Brown and Caldwell 2018b).

During the fall period, maximum stream temperatures were observed two years earlier in 2014 (Figure 3.9-15). The maximum daily fall temperature in 2014 occurred on September 24, slightly after the average date of September 21. Observed conditions during the weekly period immediately before and after September 24, 2014, therefore represent the period of low-flow, maximum weekly fall temperatures. The range of observed temperatures during this fall period was 6.6 to 15.7 degrees Celsius (approximately 44 to 60 degrees Fahrenheit) (Brown and Caldwell 2018b).

Overall, these weekly summer and fall values offer a better representation of the low flow, maximum seasonal temperatures than the monthly data, and therefore provide a better baseline for comparison to thermal criteria and future predicted temperature increases.

**Impaired Waterbodies**

The federal CWA requires states to prepare a report listing the current condition of all state waters and identifying streams that are impaired because they do not meet their designated beneficial uses. IDEQ’s 2018/2020 Integrated Report (IDEQ 2020a) provides the Section 305(b) list (condition of state waters) and the Section 303(d) list of impaired waters in the State of Idaho. Stream segments identified on the Section 303(d) list are classified as Category 5 waters, defined as waters that do not meet applicable water quality standards for one or more beneficial uses due to one or more pollutants.
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Table 3.9-14 Summary of Baseline Total Suspended Solids for Surface Water Assessment/Prediction Nodes (Total Suspended Solids (mg/L))

<table>
<thead>
<tr>
<th>Assessment Node</th>
<th>YP-T-27 Meadow Creek (n=35)</th>
<th>YP-T-22 Meadow Creek (n=35)</th>
<th>YP-SR-10 East Fork SFSR below Meadow Creek (n=35)</th>
<th>YP-SR-8 East Fork SFSR above Fiddle Creek (n=35)</th>
<th>YP-T-11 Fiddle Creek (n=35)</th>
<th>YP-SR-6 East Fork SFSR above Yellow Pine Pit (n=35)</th>
<th>YP-T-6 West End Creek (n=34)</th>
<th>YP-T-1 Sugar Creek (n=35)</th>
<th>YP-SR-4 East Fork SFSR above Sugar Creek (n=35)</th>
<th>YP-SR-2 East Fork SFSR below Sugar Creek (n=35)</th>
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</thead>
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<tr>
<td>Month</td>
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<td>Average</td>
<td>Max</td>
<td>Min</td>
<td>Avg</td>
<td>Max</td>
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</tr>
</tbody>
</table>

Source: HDR 2017f

Where sample number is <3, only average values are reported.

mg/L = milligrams per liter.

Min = minimum.

Max = maximum.
<table>
<thead>
<tr>
<th>Assessment Node</th>
<th>YP-T-27 Meadow Creek (n=35)</th>
<th>YP-T-22 Meadow Creek (n=35)</th>
<th>YP-SR-10 East Fork SFSR below Meadow Creek (n=35)</th>
<th>YP-SR-8 East Fork SFSR above Fiddle Creek (n=35)</th>
<th>YP-T-11 Fiddle Creek (n=35)</th>
<th>YP-SR-6 East Fork SFSR above Yellow Pine Pit (n=34)</th>
<th>YP-T-6 West End Creek (n=34)</th>
<th>YP-T-1 Sugar Creek (n=35)</th>
<th>YP-SR-4 East Fork SFSR above Sugar Creek (n=35)</th>
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<tbody>
<tr>
<td><strong>Month</strong></td>
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<td><strong>Avg</strong></td>
<td><strong>Max</strong></td>
<td><strong>Min</strong></td>
<td><strong>Avg</strong></td>
<td><strong>Max</strong></td>
<td><strong>Min</strong></td>
<td><strong>Avg</strong></td>
<td><strong>Max</strong></td>
<td><strong>Min</strong></td>
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</table>

Source: HDR 2017f

NTU = Nephelometric Turbidity Units.
Where sample number is ≤3, only average values are reported.
- = No monitoring data available.
Min = minimum.
Max = maximum.
Table 3.9-16  Summary of Average, Minimum, and Maximum Monthly Grab Sample Water Temperatures for the Surface Water Assessment Nodes (Temperature (°C))

<table>
<thead>
<tr>
<th>Assessment Node</th>
<th>YP-T-27 Meadow Creek (n=35)</th>
<th>YP-T-22 Meadow Creek (n=35)</th>
<th>YP-SR-10 East Fork SFSR below Meadow Creek (n=35)</th>
<th>YP-SR-8 East Fork SFSR above Fiddle Creek (n=35)</th>
<th>YP-T-11 Fiddle Creek (n=35)</th>
<th>YP-SR-6 East Fork SFSR above Yellow Pine Pit (n=35)</th>
<th>YP-T-6 West End Creek (n=34)</th>
<th>YP-T-1 Sugar Creek East Fork SFSR above Sugar Creek (n=35)</th>
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<tr>
<td>Month</td>
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<td>Avg</td>
<td>Max</td>
<td>Min</td>
<td>Avg</td>
<td>Max</td>
<td>Min</td>
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Source: HDR 2017

Where sample number is < 3, only average values are reported.
- = No monitoring data available.
°C = degrees Celsius.
Min = minimum.
Max = maximum.
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Figure 3.9-14
Summer Surface Water Temperature Observations (centered on August 1)
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2018)
Figure 3.9-15
Fall Surface Water Temperature Observations
(centered on September 21)

Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2018)
Based on data from the 2016 Integrated Report, all inventoried waterbodies at the mine site are classified as Category 5 impaired waters except for West End Creek (which is a Category 2 stream that fully supports its designated uses). A summary of the current designated beneficial uses and causes of impairment for the impaired waterbodies at the mine site is provided in Table 3.9-17. The causes for listing are associated with arsenic, with the East Fork SFSR also being listed for antimony (downstream of Meadow Creek), and Sugar Creek also being listed for mercury. The listed constituents are similar to the constituents of interest identified in the Surface Water Quality Baseline Study (HDR 2017f).

Table 3.9-17 IDEQ Designated Beneficial Uses and Waterbody Status at the Mine Site

<table>
<thead>
<tr>
<th>NHD Waterbody¹</th>
<th>Beneficial Uses²</th>
<th>IDEQ Status²</th>
<th>Cause of Impairment²</th>
<th>IDEQ Category²</th>
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</thead>
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<tr>
<td>East Fork SFSR 3rd order</td>
<td>COLD, DWS, PCR, SCR, SS</td>
<td>Not supporting DWS and SCR</td>
<td>Antimony (DWS), arsenic (DWS, SCR)</td>
<td>303(d) listed Category 5</td>
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<td>East Fork SFSR 1st and 2nd order</td>
<td>COLD, DWS, PCR, SS</td>
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<td>Arsenic</td>
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<td>Unnamed tributary to East Fork SFSR (Rabbit Creek)</td>
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<td>Not supporting DWS and SCR</td>
<td>Arsenic</td>
<td>303(d) listed Category 5</td>
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<td>Meadow Creek</td>
<td>COLD, DWS, PCR, SS</td>
<td>Not supporting DWS and SCR</td>
<td>Arsenic</td>
<td>303(d) listed Category 5</td>
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<td>Garnet Creek</td>
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<td>Not supporting DWS and SCR</td>
<td>Arsenic</td>
<td>303(d) listed Category 5</td>
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<td>Fiddle Creek</td>
<td>COLD, DWS, PCR, SS</td>
<td>Not supporting DWS and SCR</td>
<td>Arsenic</td>
<td>303(d) listed Category 5</td>
</tr>
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<td>Midnight Creek</td>
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<td>Arsenic</td>
<td>303(d) listed Category 5</td>
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<tr>
<td>Unnamed tributary to East Fork SFSR (Hennessy Creek)</td>
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<td>Not supporting DWS and SCR</td>
<td>Arsenic</td>
<td>303(d) listed Category 5</td>
</tr>
<tr>
<td>West End Creek</td>
<td>COLD, PCR, SCR, SS</td>
<td>Fully supporting</td>
<td>-</td>
<td>Category 2</td>
</tr>
<tr>
<td>Sugar Creek (3rd order Cane Creek to mouth)</td>
<td>COLD, PCR, SS</td>
<td>Not supporting COLD and SCR</td>
<td>Arsenic (PCR), mercury (COLD, PCR, SS)</td>
<td>303(d) listed Category 5</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2017a

¹ National Hydrography Dataset (NHD) waterbody Proper Name. Parenthesized names are unofficial but locally common names included for clarity.

² Status and causes from 2018/2020 Integrated Report (IDEQ 2020a). COLD = cold water aquatic life; SS = salmonid spawning; PCR = primary contact recreation; SCR = secondary contact recreation; DWS = drinking water supply.
Off-Site Facilities and Access Roads

The Surface Water Quality Baseline Study (HDR 2017f) did not include sample locations outside of the proposed SGP. However, streams adjacent to proposed access roads, utility corridors, and off-site facilities have the potential to be impacted by these SGP activities. The types of impacts that could occur are usually described qualitatively because little is known about the existing water quality of these streams. However, for Category 5 waters that have a 303(d)-listed water quality impairment, it is possible to conduct a more specific analysis evaluating how levels of the impaired constituent(s) may be impacted by SGP activities.

IDEQ has inventoried 11 lakes and 701 different stream segments in the surface water quality analysis area. Of these features, 66 are classified as Category 5 waters. Figure 3.9-16 shows the inventoried stream segments within the analysis area, broken down by “Fully Supporting” beneficial uses (Categories 1 and 2), “Not Assessed” (Category 3), “Not Supporting” beneficial uses (Category 4), and “Not Supporting/303(d) Listed” (Category 5).

In the western portion of the inventory area, waters that are not supporting beneficial uses are concentrated in the agricultural valley that drains towards Lake Cascade (Cascade Reservoir). Causes for the listing of these waters are largely tied to phosphorus and flow regime alteration, with some streams also listed for temperature, sedimentation/siltation, and biota/habitat assessment considerations. Cascade Reservoir is specifically listed for phosphorus and pH.

In the central portion of the inventory area, waters that are not supporting beneficial uses are primarily associated with the SFSR and its tributaries, and Johnson Creek and its tributaries. Causes for listing of the SFSR and tributaries are primarily associated with temperature and sedimentation/siltation; causes for listing of Johnson Creek and tributaries are primarily associated with temperature.

Impaired waterbodies in the eastern portion of the inventory area are primarily associated with the Meadow Creek and upper East Fork SFSR watershed impacted by elevated arsenic concentrations. Water quality impairments for the mine site streams have been discussed above and are summarized in Table 3.9-17.
Current Conditions for Surface Waters

Stibnite Gold Project
Stibnite, ID

Data Sources: (AECOM 2020)

Figure 3.9-16
IDEQ Current Conditions for Surface Waters
Stibnite Gold Project
Stibnite, ID

LEGEND
- Surface Water Analysis Area
- IDEQ Streams
  - Fully Supporting
  - Not Assessed
  - Not Supporting
  - Not Supporting/303d Listed
- IDEQ Lakes
  - Fully Supporting
  - Not Assessed
  - Not Supporting
- Other Features
  - County
  - City/Town
  - Monumental Summit
  - Railroad
  - Highway
  - Road
- Surface Land Management
  - Bureau of Land Management
  - Bureau of Reclamation
  - Private
  - State
  - U.S. Forest Service

Note:
He McCa ll-St ibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.

1 inch = 3.45 miles when printed at 1:17,000.
3.9.4.5 Yellow Pine Pit Lake

A lake has formed in the former Yellow Pine pit where the East Fork SFSR flows through it. The existing pit lake has an estimated maximum depth of 35 feet and an approximately 4.75-acre surface area with a contained water volume of approximately 92 acre-feet. Originally, the pit was excavated to a depth 125 feet below the current water level, but the excavation has filled with approximately 90 feet of sediment (Brown and Caldwell 2017a).

Water chemistry samples were collected in two 1999 sampling events at the surface and bottom of the lake at three locations across the lake from inflow to outlet plus one intermediate depth at the middle location (URS 2000b, Tables 8.1-21, 8.1-22, and 8.1-23). Circumneutral pH values were observed ranging from 7.2 to 8.2 with low TDS concentrations between 47 and 78 mg/L. Analyses of total and dissolved metals indicated that concentrations of most metals were below reported analytical detection limits with the exceptions of antimony, arsenic, iron, magnesium, and manganese. Dissolved mercury was detected in a single sample at 0.23 mg/L but all other dissolved and total mercury analyses (including the companion total mercury analysis for that location) were below method detection limits reported between 0.042 mg/L and 0.063 mg/L. Analyses able to detect mercury concentrations at lower concentrations were not conducted as part of the 1999 investigation. These analytical method detection limits are greater than the strictest potentially applied water quality standard and it is uncertain whether the pit lake water meets that standard.

Concentrations of antimony and arsenic exceeded the strictest potentially applied water quality standards for all samples analyzed with total antimony concentrations ranging between 0.020 mg/L and 0.033 mg/L and total arsenic concentrations ranging between 0.047 mg/L and 0.098 mg/L. There was no clear spatial trend in the antimony and arsenic concentration measurements and total concentrations for these analytes were close to dissolved concentrations. The other metals detected were below the strictest potentially applied water quality standards.

Continuous water temperature data was collected from the Yellow Pine pit lake at locations near its inflow and outflow (Figure 3.9-17; Brown and Caldwell 2021i). These temperature measurements closely resemble stream water temperature measurements collected from USGS Gauges 13311000 and 13311250 upstream and downstream of the lake, respectively (Figure 3.9-18). In general, there are wider diurnal ranges in upstream water temperatures than in the downstream water temperatures, indicating that the Yellow Pine pit lake acts to moderate daily temperature variability.

3.9.4.6 Groundwater

This section focuses on quantifying the baseline groundwater chemistry in areas monitored by the 17 monitoring wells of interest listed in Table 3.9-18 with locations shown on Figure 3.9-19. The discussion of baseline chemistry is organized around the groundwater quality indicators, which include pH, major cations and anions, TDS, and metals.

It should be noted that baseline water quality at the mine site is influenced by both natural mineralization and historical mining activity.
Major Ions, pH, and TDS

Average baseline water quality characteristics measured between 2012 and 2018 for the groundwater monitoring wells of interest are summarized in Table 3.9-18. Calcium tends to be the dominant cation in most of the alluvial monitoring wells with bicarbonate or sulfate dominant anions. As a result, most alluvial wells in the mine site have a calcium bicarbonate water quality signature, but a few wells (MWH-A05, MWH-A07, MWH-A18, and MWH-A19) exhibit a calcium-sulfate water type. The calcium-sulfate wells are located proximal to and immediately downgradient of legacy mining facilities (HDR 2016a). Overall, the major ion chemistry of alluvial groundwater at the mine is similar to surface water, illustrating the interconnectedness between the groundwater and surface water systems.

Most of the bedrock monitoring wells (screened between a range of 208 to 815 feet bgs) also display a calcium-bicarbonate water quality signature. Notably, several alluvial and bedrock well pairs exhibit similar characteristics. Many of the bedrock wells are screened at relatively shallow depths below ground surface near the valley walls where the alluvial aquifer is thinner (HDR 2016a), and the bedrock is hydraulically connected to the alluvium deposits.

Despite the overall dominance of calcium and bicarbonate, the major ion chemistry of the bedrock aquifer tends to be more variable than the alluvium. For instance, samples from bedrock wells MWH-B03, MWH-B04, and MWH-B07 consistently have sodium and bicarbonate as the major cation-anion pair. These wells are screened at deeper depths near the center of the alluvial valleys. In addition, monitoring well MWH-B05 typically exhibits monthly variations in the major ion geochemistry potentially attributable to its shallower screened interval in the bedrock observing the effects of seasonal recharge in the overlying alluvium.

Average TDS concentrations in the groundwater wells of interest are variable but tend to be less than the 500 mg/L Idaho secondary groundwater standard. The average TDS values shown in Table 3.9-18 range from 58 to 465 mg/L for the alluvial wells, and from 60 to 415 mg/L for the bedrock wells.

Field-measured pH values for the groundwater wells of interest were generally in the range of 6.1 to 8.9 standard units. The highest average pH (8.86) was observed in bedrock well MWH-B04. This pH value slightly exceeds the Idaho secondary groundwater standard. Overall, the circumneutral to alkaline pH values observed in groundwater near the mine site show that the geochemistry of natural mineralized deposits and legacy mine materials is not conducive to acidic rock drainage.

Constituents of Interest

The Groundwater Quality Baseline Study (HDR 2016a) showed that several metals are present in mine site groundwater at concentrations that exceed the Idaho primary and secondary groundwater quality standards. The constituents exceeding applicable standards typically include antimony, arsenic, iron, and manganese in alluvial groundwater, and aluminum, antimony, arsenic, and iron in the bedrock groundwater. Therefore, these metals were selected as constituents of interest because of their potential to exceed regulatory standards and impact water and biological resources. Based on Table 3.9-18, average concentrations measured for the monitoring wells of interest are representative of the broader baseline study findings. Data presented in this table show that average concentrations of pH, aluminum, arsenic, iron, manganese, and antimony exceed the groundwater quality standards from Table 3.9-1 at one or more wells.
Figure 3.9-17
Yellow Pine Pit Lake
Temperature Observation Locations
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021c)
Figure 3.9-18
Yellow Pine Pit Lake Temperature Observations
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021c)

USGS stations are 1.5mi upstream and 0.5mi downstream of YPP. Perpetua stations are nearer to the inlet and outlet.
Figure 3.9-19
Groundwater Chemistry Monitor Locations
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
Figure 3.9-20
Dissolved Antimony Concentrations in Groundwater
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2017)
Figure 3.9-21
Dissolved Arsenic Concentrations in Groundwater

Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2017)
Table 3.9-18 Average Groundwater Chemistry (2012 to 2018) for Select Alluvial and Bedrock Wells

Bedrock aquifer
(MWH-B04)1

Alluvial aquifer
(MWH-A05)1

Bedrock aquifer
(MWH-B05)1

Alluvial aquifer
(MWH-A07)1

Bedrock aquifer
(MWH-B07)1

Alluvial aquifer
(MWH-A18)1

Alluvial aquifer
(MWH-A19)1

Alluvial aquifer
(MWH-A14)1

Alluvial aquifer
(MWH-A15)1

Bedrock aquifer
(MWH-B15)1

Bedrock aquifer
(MWH-B20)1

Alluvial Aquifer
(MWH-A08)1

Bedrock Aquifer
(MWH-B01)1

Upgradient

Alluvial aquifer
(MWH-A04)1

Yellow Pine Pit

Bedrock aquifer
(MWH-B02)1

Hangar Flats Pit

East Fork
SFSR
Headwaters

Alluvial aquifer
(MWH-A02)1

TSF Buttress

West
End Pit

Alluvial aquifer
(MWH-A01)1

TSF

Fiddle Growth
Media Stockpile

Idaho Groundwater
Quality Standard
(IDAPA 58.01.11)

Proposed Mine Feature

Meadow Creek
Valley

6.5 - 8.5*

7.46

6.9

6.67

6.62

8.86

6.62

7.04

6.09

8.15

6.19

6.34

7.64

7.09

8.39

8.12

7.04

8.56

-

59.9

138

39.3

56.3

174

104

176

65.8

214

25.6

22.4

119

25.6

82.1

157

71.9

66

mg/L

0.1*

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

0.00003

<0.00002

Al

mg/L

0.2*

0.0068

0.0046

0.054

0.0067

0.038

0.0045

0.017

0.028

0.28

0.035

0.0085

0.0052

0.0046

0.24

0.0029

0.0066

0.019

As

mg/L

0.05

0.0064

0.0055

0.00054

1.1

0.11

1.9

0.14

0.20

0.25

0.033

4.7

0.35

0.087

0.32

0.3

0.019

0.013

B

mg/L

-

0.01

0.01

0.011

0.013

0.051

0.023

0.018

0.012

0.031

0.0098

0.011

0.009

0.011

0.024

0.008

0.009

<0.011

Ba

mg/L

2

0.0019

0.021

0.0029

0.01

0.64

0.033

0.049

0.018

0.019

0.017

0.046

0.016

0.017

0.041

0.048

0.045

0.0037

Be

mg/L

0.004

<0.00002

<0.00002

0.000021

<0.00002

<0.00002

<0.00002

<0.00002

0.000027

0.000065

0.00017

0.000013

<0.00002

<0.00002

0.00005

<0.00002

<0.00002

<0.00002

Ca

mg/L

-

18

30.7

10.4

18.1

7.69

83.5

65.4

75.6

14.5

83.9

36.5

32

5.11

15.5

34.9

19

18.8

Cd

mg/L

0.005

<0.00002

<0.00002

<0.00002

<0.00002

<0.00002

0.000035

<0.00002

0.000038

0.000017

0.000023

<0.00002

<0.00002

<0.00002

0.00002

<0.00002

<0.00002

<0.00002

Cl

mg/L

250*

0.3

7.4

0.27

0.52

0.28

9.2

2.1

2.5

1. 8

6

0.72

0.47

0.42

0.97

0.28

0.4

0.4

Cyanide

mg/l

0.2

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

0.011

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

<0.0027

Co

mg/L

-

0.0001

0.00099

0.00028

0.00071

0.00017

0.00188

0.00073

0.0033

0.00042

0.00025

0.00011

0.00023

0.000054

0.00069

0.00014

0.00006

0.00014

Cr

mg/L

0.1

0.00028

0.00026

0.0002

0.00017

0.00043

0.00014

0.0003

0.00019

0.00057

0.00019

0.00028

0.00027

0.00014

0.00026

0.00027

0.00026

0.00022

Cu

mg/L

1.3

0.00048

0.00032

0.00038

0.00094

0.00061

0.0016

0.0016

0.0014

0.0007

0.00063

0.001

0.00056

0.00013

0.00041

0.00043

0.0022

0.00035

F

mg/L

4

0.11

0.11

0.094

0.1

0.68

0.15

0.89

0.17

3.2

0.16

0.15

0.11

0.09

0.59

0.12

0.11

0.23

Fe (total)

mg/L

0.3*

0.134

2.8

1.7

2.1

0.23

0.21

0.37

1.3

1.7

4.3

1.1

0.38

0.23

6.93

0.061

0.2

0.16

Hg

mg/L

0.002

5.60E-07

8.20E-06

1.40E-06

2.50E-05

8.80E-07

6.60E-05

1.50E-06

1.00E-05

1.80E-06

2.70E-06

2.00E-06

6.60E-07

7.40E-07

3.80E-06

4.30E-07

7.40E-07

5.80E-07

K

mg/L

-

0.77

1.5

0.58

1.3

1.2

2.7

2.4

3.6

1

2

1.4

1.7

0.9

0.95

3.13

1.58

0.66

Mg

mg/L

-

1.48

8.07

1.17

3.26

1.78

20.6

15.5

31.4

3.77

22.1

8.02

10.63

1.15

2.29

24.1

5.32

1.89

Mn

mg/L

0.05*

0.001

2.8

0.012

1.1

0.07

2.2

0.07

0.36

0.021

0.026

0.0021

0.0039

0.0009

0.019

0.01

0.001

0.0013

Mo

mg/L

-

0.0012

0.0023

0.0003

0.001

0.0036

0.0016

0.0048

0.0022

0.012

0.000089

0.00031

0.003

0.00023

0.0051

0.0045

0.00086

0.0061

Na

mg/L

-

2.68

15.4

3.91

5.33

70

15.24

49.2

8.19

133

4.58

3.72

3.9

3.58

27.8

2.55

3.58

7

Ni

mg/L

-

0.00021

0.00079

0.00038

0.00061

0.00026

0.0024

0.0012

0.0014

0.00054

0.0017

0.00058

0.00045

0.00017

0.00051

0.00093

0.00027

<0.0002

P

mg/L

-

0.024

0.033

0.02

0.066

0.023

0.044

0.053

0.031

0.021

0.023

0.32

0.023

0.038

0.026

0.026

0.018

0.022

Pb

mg/L

0.015

0.000029

0.000046

0.000055

0.000047

0.000064

0.0000 4

0.00013

0.000042

0.00023

0.000021

0.000036

0.00004

<0.00002

0.00021

0.000037

0.00012

0.000034

Sb

mg/L

0.006

0.002

9.10E-05

0.0016

0.0013

0.00062

0.12

0.12

1.08

0.0011

0.2

0.01

0.0422

0.004

0.01

0.019

0.015

0.0044

Se

mg/L

0.05

<0.001

<0.001

<0.001

0.00092

0.00098

0.00 076

0.00085

0.0008

0.00094

0.00078

0.0016

<0.001

<0.001

<0.001

<0.001

<0.001

<0.001

Parameter

Units

pH

s.u.

Alkalinity

mg/L as
CaCO3

Ag

Stibnite Gold Project Supplemental Draft Environmental Impact Statement

3-210


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<td>&lt;0.00002</td>
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<td>0.00044</td>
<td>57.9</td>
<td>0.076</td>
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<td>26.9</td>
<td>&lt;0.00002</td>
<td>0.00009</td>
<td>172</td>
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<td>37.5</td>
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<td>198</td>
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<td></td>
<td>8.31</td>
<td>&lt;0.00002</td>
<td>0.00033</td>
<td>86.4</td>
<td>0.047</td>
<td></td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2019; HDR 2016a; Midas Gold 2019c; SRK Consulting (SRK) 2018a

1 Represents average chemistry measured during the 2012-2018 baseline period. Concentration values represent the dissolved fraction unless otherwise noted.

2 Bolded values exceed the respective Idaho Groundwater Quality Standard (IDAPA 58.01.11).

TSF = Tailings storage facility.

mg/L = milligrams per liter.

- Indicates no standard for parameter.

* Indicates secondary standard.

< = less than detection limit.
Based on these findings, antimony and arsenic were identified as constituents of interest in groundwater. This determination is supported by the fact that groundwater quality criteria associated with antimony and arsenic were established to protect human health, whereas criteria for iron, aluminum, and manganese are based on secondary standards established to protect aesthetic and cosmetic qualities of drinking water. Mercury was not identified as a groundwater constituent of interest, because both total and dissolved mercury concentrations were consistently reported below the water quality standard in the alluvial and bedrock monitoring wells. Although certain waterways in the Stibnite Mining District have drinking water supply as a designated use (e.g., Meadow Creek, Garnet Creek, Fiddle Creek, and Midnight Creek), and Idaho groundwater quality standards apply throughout the Stibnite Mining District, there are no current, contemplated, or likely future public water supply intakes or wells in the zones at the SGP where metals levels exceed applicable standards. However, the implications of mercury concentrations in groundwater on surface water chemistry was retained as part of the impact analysis.

**Figure 3.9-20** illustrates the trend in dissolved antimony concentrations for groundwater monitoring locations across the mine site. During the baseline study, the fraction of antimony adsorbed onto solid particulates was found to be small, suggesting that the antimony concentration is adequately represented by the dissolved phase of this constituent (HDR 2016a). The figure shows that mean dissolved antimony concentrations are generally below the 6 µg/L Idaho primary groundwater standard in the Meadow Creek valley; however, antimony concentrations increase by two to three orders of magnitude at some of the downgradient alluvial and bedrock wells, such as MWH-A05, MWH-B05, and MWH-A07. Immediately below the confluence with Meadow Creek, groundwater antimony concentrations in the lower East Fork SFSR alluvial aquifer are elevated above the primary groundwater standard but generally decrease in concentration downgradient. The baseline dissolved antimony concentrations exceed the Idaho primary groundwater standard in wells MWH-A14 and MWH-B15 upgradient of Yellow Pine pit. In the Sugar Creek valley, the average dissolved antimony concentration also is above the Idaho primary groundwater standard in bedrock well MWH-B20 near the proposed location of the West End pit.

For most samples collected during the Groundwater Quality Baseline Study (HDR 2016a), 90 to 100 percent of arsenic was found to occur in the dissolved fraction. **Figure 3.9-21** illustrates the trend in dissolved arsenic concentrations for groundwater monitoring locations across the mine site. The figure shows that near wells MWH-A01 and MWH-A03 in the upper Meadow Creek valley, dissolved arsenic is on average higher in the bedrock aquifer than in the alluvium. This trend is reversed farther downgradient in the valley, where monitoring wells MWH-A04 and MWH-A05 have some of the highest average dissolved arsenic concentrations observed during baseline monitoring. The increase in dissolved arsenic in this area is likely due to the influence of historical mining materials.

In both the alluvial and bedrock aquifer, average dissolved groundwater arsenic concentrations were mostly above the primary groundwater standard in the lower East Fork SFSR and Sugar Creek valleys. This includes groundwater monitoring wells MWH-A14, MWH-A15, MWH-B15, and MWH-B20 near Yellow Pine pit.

Overall, dissolved concentrations of antimony and arsenic fluctuate seasonally, but to a lesser extent in bedrock wells than in alluvial wells. Concentrations are generally lower during spring and higher during
the fall. This suggests that the concentrations are being diluted in springtime by freshwater recharge, but that concentrations increase during fall when groundwater levels typically approach seasonal lows.

3.10 Vegetation

3.10.1 Introduction

This section describes the existing conditions of vegetation communities, and botanical resources, and non-native plants in the analysis area. This summary is based on best available information from the Forest Service, IDFG, and USFWS. Additional details and information can be found in the SGP Vegetation Specialist Report (Forest Services 2022g).

3.10.2 Vegetation Resources Area of Analysis

The analysis area covers approximately 17,397 acres of land, with 9,062 acres (52 percent) on the BNF, 4,942 acres (28 percent) on the PNF, 347 acres (2 percent) on the Salmon-Challis National Forest, and 3,046 acres (18 percent) outside Forest Service boundaries. The analysis area is shown in Figure 3.10-1.

The 300-foot buffer was selected to encompass an area where direct and indirect impacts (e.g., dust, impacts to pollinators, etc.) from the action alternatives could impact vegetation.

3.10.3 Relevant Laws, Regulations, Policies, and Plans.

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to vegetation resources. Additional descriptions of these regulations can be found in the SGP Vegetation Resources Specialist Report (Forest Service 2022g).

Land and Resource Management Plan: The Payette and Boise Forest Plans (Forest Service 2003a, 2010a) establish goals, objectives, standards, and guidelines that provide a framework for the analysis of impacts on vegetation, botanical resources (including ESA-listed threatened, endangered, proposed, and candidate species and Forest Service-designated sensitive species), and non-native plants.

The National Forest Management Act: The NFMA requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the NFS. The NFMA, as amended, and its implementing regulations under 36 CFR 219, consolidate and articulate Forest Service management planning responsibilities for lands and resources of the NFS.

Endangered Species Act: The ESA (16 USC Ch. 35 Section 1531 et seq. 1988) is federal legislation that is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and animals. Aspects of the law pertaining to plants are administered by the USFWS.
Figure 3.10-1
Analysis Area
Stibnite Gold Project
Stibnite, ID

**LEGEND**
- **Analysis Area**
  - Project Components
    - SGP Features
    - Existing Road Facility *
    - Landmark Maintenance Facilities * *
    - Substation Location * * *
- **Utilities**
  - New Upgraded Transmission Line
  - New Transmission Line
  - Existing Substation
  - New Substation
- **Other Features**
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
  - Railroad
  - Highway
  - Road
  - Stream/River
  - Lake/Reservoir


Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

**Note:** The McCall - Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Salmon Road.
Federal Noxious Weed Act: The Federal Noxious Weed Act of 1974 (P.L. 93-629) (7 USC 2801 et seq., 88 Stat. 2148) directs the management of undesirable plants on federal lands, including prohibiting the transport of noxious weeds into the U.S. and between states. This legislation also outlines how noxious weed infestations are to be quarantined and controlled on federal lands. This act also requires agencies to develop programs to eradicate undesirable plants and “establish and adequately fund an undesirable plants management program through the agency’s budgetary process; complete and implement cooperative agreements with state agencies regarding the management of undesirable plant species on federal lands under the agency’s jurisdiction; and establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements” (7 USC 2418). In addition, federal law requires agencies to consult with state and local agencies to develop a coordinated weed management effort.

Forest Service Manual 2670: FSM 2670 (Threatened, Endangered, and Sensitive Plants and Animals) gives management direction for conservation, management, and recovery of sensitive species on Forest Service-administered lands. This FSM states that sensitive plant species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. Under this guidance, there must be no impacts to a sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species in the planning area (for this analysis, the planning area is a Forest in which a species occurs).

Forest Service Manual 2900: FSM 2900, Invasive Species Management, sets forth NFS policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens).

U.S. Department of Agriculture Departmental Regulation 9500-004: USDA Departmental Regulation 9500-004 outlines USDA’s responsibility “to help maintain sufficient and efficient production capability of farm, forest, water, and rangeland resources for the public benefit, now and in the future, and to encourage and support proper use, management, and conservation of those natural resources” (USDA 2008). This Departmental Regulation was established to describe the USDA’s goal of improving fish and wildlife habitats where needed and ensuring the presence of diverse, native, and desired nonnative populations of wildlife, fish, and plant species (USDA 2008). Impacts to rare plant species in the analysis area, including those designated as forest watch species, are included in the analysis to determine adherence to this regulation.

The Sawtooth and Boise National Forests Invasive Species Project Final Environmental Impact Statement and Record of Decision: The Sawtooth and Boise National Forests Invasive Species Project FEIS (Forest Service 2019a) documents the analysis conducted for the Sawtooth and Boise National Forests Invasive Species Project. The overall purpose of the proposed action was to reduce the negative effects of existing and future invasive plants on the structure and function of native plant communities and on other natural resource values within the administrative boundaries of the Sawtooth and Boise National Forests. The ROD for this project (Forest Service 2019b) documents selection of the EIS proposed action to eradicate or control existing or newly discovered invasive plants using an integrated weed management strategy.

The South Fork Salmon River Subbasin Noxious and Invasive Weed Management Program EIS and RODs: The SFSR Subbasin Noxious and Invasive Weed Management Program EIS (Forest Service
2010c) was developed to evaluate and disclose the impacts of alternative management strategies to manage noxious and invasive weeds in the SFSR subbasin outside the FCRNRW on the PNF and BNF. The PNF and BNF each issued separate RODs for this EIS for portions of the project on lands within their respective jurisdictions (Forest Service 2007a, 2010d). Both Forests selected the preferred alternative (Alternative C), though the BNF ROD included modifications to the preferred alternative.

In accordance with the Federal Noxious Weed Act, the SFSR Subbasin Noxious and Invasive Weed Management Program was implemented by the PNF in 2007, and BNF in 2010. The purpose of this program is to develop criteria to prioritize weed species and treatment areas in the SFSR subbasin; Identify and treat existing priority weed infestations in the SFSR subbasin on the PNF and BNF using a variety of methods including herbicide application; Prevent or limit the introduction and establishment of identified weed species, particularly in areas at high risk due to recent fires; and Restore and maintain native plant communities and protect the natural functioning condition and native biodiversity of ecosystems in the SFSR subbasin.

Executive Orders 13112: EO 13112 requires that federal agencies prevent the introduction and spread of invasive species, detect and respond rapidly to control such species, monitor invasive species populations, and restore native species and habitat conditions in ecosystems that have been invaded. In addition, the order requires a federal agency to “not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.”

Idaho Invasive Species Act of 2008: The Idaho Invasive Species Act of 2008 provides policy direction, planning, and authority to combat invasive species infestations throughout the state and to prevent the introduction of new species that may be harmful. This act defines the different classes of weeds and sets priority for their containment and eradication.

Idaho Statute Title 22, Chapter 24 (22-2407): Idaho Statute Title 22, Chapter 24 (22-2407) outlines landowner and citizen duties for controlling and treating noxious weeds on public and private land.

The Idaho Department of Agriculture Administrative Rule 02.06.09: The Idaho Department of Agriculture Administrative Rule 02.06.09 governs the designation of invasive species, inspection, permitting, decontamination, recordkeeping, and enforcement of regulated invasive species, including invasive plant species defined under the Idaho Plant Pest Act of 2002.

Valley County Regulations: Valley County administers noxious weed control and monitoring under Idaho Statute Title 22, Chapter 24 (22-2407).

3.10.4 Affected Environment

3.10.4.1 Vegetation Communities

Forest Potential Vegetation Groups in the Analysis Area within Forest Service-Managed Land

The Forest Service maps PVGs in the PNF and BNF and updates this information periodically (most recently in 2005 for the PNF and 2017 for the BNF). This mapping is available only for NFS lands.
Approximately 347 acres (2 percent) of the analysis area occur in the Salmon-Challis National Forest (administered by the PNF); however, PVG data were not available for this area.

In Forest Service mapping, PVGs are forested habitat types that share similar environmental characteristics, site productivity, and disturbance regimes. PVGs are generally a description of the climax plant community that could be supported by a site, as determined by abiotic conditions such as climate, soil types, hydrological conditions, and topographical aspect. The extent (in acres) of PVGs in the analysis area is presented in Table 3.10-1. Descriptions and maps of PVGs in the analysis area are presented in Appendix A of the SGP Vegetation Specialist Report (Forest Service 2022g).

The existing vegetation map layer can be used to describe seral-stage (intermediate ecological succession) plant community composition as it was at the time of the most recent mapping. Note that information in existing vegetation mapping has not been verified on-the-ground within the analysis area; however, an accuracy assessment is associated with this mid-scale map.

Existing vegetation mapping typically describes the current dominant vegetative cover or species occupying a site and is frequently updated to reflect vegetation changes due to disturbance such as fire, insects, and disease. In general, existing vegetation types in the analysis area are coniferous forests typical of high mountain regions in Idaho and the inland northwestern U.S. The most common existing vegetation types in the analysis area are lodgepole pine (*Pinus contorta*) forests, subalpine fir (*Abies lasiocarpa*) forests, Douglas-fir (*Pseudotsuga menziesii*) forests, ponderosa pine (*Pinus ponderosa*) forests, and Engelmann’s spruce (*Picea engelmannii*) forests. Other vegetation types include grand fir (*Abies grandis*) forests, aspen (*Populus tremuloides*) forests, and whitebark pine (*Pinus albicaulus*) forests. Fires routinely occur in the analysis area and surrounding forests, and as such, much of the analysis area and vicinity is now mapped as burned herblands (grasses and forbs), burned sparse vegetation, and burned forest shrublands reflective of earlier seral stages.

A mature limber pine (*Pinus flexilis*) stand occurs in the area of the SGP (2019 Whitebark Pine Survey Report [Tetra Tech 2020b] for a map of this location). Although limber pine has no listing status in the state of Idaho, mature limber pine trees are uncommon in the surrounding Forests, and this may be the only documented population of this species on the PNF (Mancuso 2016). This stand overlaps various PVGs mapped as PVG 7 - Cool Dry Subalpine Fir (overlap of 8.8 acres), PVG 10 - Persistent Lodgepole Pine (overlap of 25.8 acres), PVG 11 - High Elevation Subalpine Fir (overlap of 0.7 acre), and areas not successional to forests (overlap of 7.8 acres).

**Non-Forested Vegetation Groups in the Analysis Area within Forest Service-Managed Land**

PVG mapping has identified some acreages in the analysis area as not being successional to forests. Acreages of existing vegetation mapping within these areas are presented in Table 3.10-2. As PVG mapping and existing vegetation mapping are performed using different processes and have different objectives, forest vegetation types (as identified in existing vegetation mapping) can occur within areas identified as not successional to forests in PVG mapping.
<table>
<thead>
<tr>
<th>PVG #</th>
<th>PVG Name</th>
<th>Total Acres in the Analysis Area(^1)</th>
<th>Undisturbed Acres in the PVG(^2)</th>
<th>Previously Disturbed Acres in the PVG(^2,3)</th>
<th>Acres of Existing Vegetation Communities in the PVG(^4,5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dry Ponderosa Pine/ Xeric Douglas-fir</td>
<td>232.2 (1.5%)</td>
<td>232.2 (100%)</td>
<td>—</td>
<td>• Douglas-fir: 83.4 acres (39.2%)</td>
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<td></td>
<td></td>
<td>• Douglas-fir/Ponderosa Pine: 59.1 acres (27.8%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Lodgepole Pine: 26.7 acres (12.5%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ponderosa Pine: 26.6 acres (12.5%)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 0.9 acre (0.4%)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 16.3 acres (7.6%)</td>
</tr>
<tr>
<td>2</td>
<td>Warm, Dry Douglas-fir/Moist Ponderosa Pine</td>
<td>2,031.8 (13.2%)</td>
<td>2,027.1 (99.8%)</td>
<td>4.7 (0.2%)</td>
<td>• Burned Herblands: 131.2 acres (7.0%)</td>
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<td></td>
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<td></td>
<td></td>
<td>• Douglas-fir: 284.9 acres (15.2%)</td>
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<td></td>
<td></td>
<td>• Douglas-fir/Ponderosa Pine: 315.0 acres (16.8%)</td>
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<td></td>
<td></td>
<td>• Lodgepole Pine: 550.1 acres (29.4%)</td>
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<td></td>
<td></td>
<td>• Ponderosa Pine: 323.4 acres (17.3%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 6.4 acres (0.3%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Riparian Shrublands/Deciduous Forests: 14.7 acres (0.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 248.4 acres (13.7%)</td>
</tr>
<tr>
<td>3</td>
<td>Cool, Moist Douglas-fir</td>
<td>62.9 (0.4%)</td>
<td>62.9 (100%)</td>
<td>—</td>
<td>• Aspen: 1.9 acres (3.5%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>• Burned Herblands: 16.5 acres (30.6%)</td>
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<td></td>
<td></td>
<td>• Burned Sparse Vegetation: 6.8 acres (12.6%)</td>
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<td></td>
<td></td>
<td>• Douglas-fir: 4.2 acres (7.7%)</td>
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<td></td>
<td>• Ponderosa Pine: 19.4 acres (35.9%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 0.6 acre (1.1%)</td>
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<td></td>
<td></td>
<td></td>
<td>• Riparian Shrublands/Deciduous Forests: 1.3 acres (2.3%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 3.4 acres (6.3%)</td>
</tr>
<tr>
<td>4</td>
<td>Cool, Dry Douglas-fir</td>
<td>1,394.2 (9.0%)</td>
<td>1,347.6 (96.7%)</td>
<td>46.6 (3.3%)</td>
<td>• Aspen: 1.6 acres (0.1%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Burned Herblands: 82.1 acres (5.9%)</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Douglas-fir: 313.7 acres (22.5%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>• Douglas-fir/Ponderosa Pine: 183.7 acres (13.2%)</td>
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<td></td>
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<td></td>
<td></td>
<td>• Lodgepole Pine: 430.2 acres (30.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ponderosa Pine: 130.6 acres (9.4%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 6.7 acres (0.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Shrubland/Deciduous Forests: 21.8 acres (1.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 221.9 acres (15.9%)</td>
</tr>
<tr>
<td>PVG #</td>
<td>PVG Name</td>
<td>Total Acres in the Analysis Area</td>
<td>Undisturbed Acres in the PVG</td>
<td>Previously Disturbed Acres in the PVG</td>
<td>Acres of Existing Vegetation Communities in the PVG</td>
</tr>
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<td>---------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Dry Grand Fir</td>
<td>463.2 (3.0%)</td>
<td>463.2 (100%)</td>
<td>-</td>
<td>• Aspen: 0.4 acre (0.1%)&lt;br&gt;• Burned Herblands: 29.8 acres (7%)&lt;br&gt;• Douglas-fir: 47.6 acres (11.1%)&lt;br&gt;• Douglas-fir/Ponderosa: 24.6 acres (5.8%)&lt;br&gt;• Lodgepole Pine: 61.5 acres (14.4%)&lt;br&gt;• Ponderosa Pine: 200.8 acres (46.9%)&lt;br&gt;• Riparian Herblands: 3.7 acres (0.9%)&lt;br&gt;• Riparian Shrubland/Deciduous Forests: 6.1 acres (1.4%)&lt;br&gt;• All others: 53.4 acres (12.5%)</td>
</tr>
<tr>
<td>6</td>
<td>Moist Grand Fir</td>
<td>372.1 (2.4%)</td>
<td>372.1 (100%)</td>
<td>-</td>
<td>• Aspen: 0.8 acre (0.2%)&lt;br&gt;• Burned Herblands: 26.3 acres (7.6%)&lt;br&gt;• Douglas-fir: 30.9 acres (8.9%)&lt;br&gt;• Douglas-fir/Ponderosa: 24.7 acres (7.1%)&lt;br&gt;• Lodgepole Pine: 78.2 acres (22.6%)&lt;br&gt;• Ponderosa Pine: 122.3 acres (35.3%)&lt;br&gt;• Riparian Herblands: 2.7 acres (0.8%)&lt;br&gt;• Riparian Shrubland/Deciduous Forests: 9.2 acres (2.7%)&lt;br&gt;• All others: 51.0 acres (14.7%)</td>
</tr>
<tr>
<td>7</td>
<td>Warm, Dry Subalpine Fir</td>
<td>3,223.8 (20.9%)</td>
<td>2,990.2 (92.8%)</td>
<td>233.7 (7.2%)</td>
<td>• Aspen: 0.3 acre (&lt;0.1%)&lt;br&gt;• Burned Herblands: 711.7 acres (22.1%)&lt;br&gt;• Burned Sparse Vegetation: 612.9 acres (19.1%)&lt;br&gt;• Douglas-fir: 186.7 acres (5.8%)&lt;br&gt;• Lodgepole Pine: 855.0 acres (26.6%)&lt;br&gt;• Riparian Herblands: 32.8% acres (1%)&lt;br&gt;• Riparian Shrubland/Deciduous Forests: 36.7 acres (1.1%)&lt;br&gt;• Subalpine Fir: 449.2 acres (14%)&lt;br&gt;• Whitebark Pine: 20.5 acres (0.6%)&lt;br&gt;• All others: 312.0 acres (9.7%)</td>
</tr>
<tr>
<td>8</td>
<td>Warm, Moist Subalpine Fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td>Hydric Subalpine Fir</td>
<td>356.7 (2.3%)</td>
<td>352.3 (98.8%)</td>
<td>4.5 (1.2%)</td>
<td>• Burned Herblands: 43.8 acres (12.3%)&lt;br&gt;• Lodgepole Pine: 203.1 acres (56.9%)&lt;br&gt;• Riparian Herblands: 26.3 acres (7.4%)&lt;br&gt;• Riparian Shrubland/Deciduous Tree: 29.4 acres (8.2%)&lt;br&gt;• Whitebark Pine: 0.2 acre (0.1%)&lt;br&gt;• All others: 53.9 acres (15.1%)</td>
</tr>
<tr>
<td>PVG #</td>
<td>PVG Name</td>
<td>Total Acres in the Analysis Area</td>
<td>Undisturbed Acres in the PVG</td>
<td>Previously Disturbed Acres in the PVG</td>
<td>Acres of Existing Vegetation Communities in the PVG 2,4,5</td>
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<td>--------------------------------------------</td>
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<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>10</td>
<td>Persistent Lodgepole Pine</td>
<td>4,145.2</td>
<td>4,045.5</td>
<td>99.8</td>
<td>• Aspen: 0.5 acres (&lt;0.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(26.8%)</td>
<td>(97.6%)</td>
<td>(2.4%)</td>
<td>• Burned Herblands: 947.8 acres (23.0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Burned Sparse Vegetation: 451.1 acres (10.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Douglas-fir: 355.1 acres (8.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Lodgepole Pine: 1,463.6 acres (35.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 65.9 acres (1.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Shrubland/Deciduous Forests: 51.7 acres (1.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Subalpine Fir: 401.5 acres (9.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Whitebark Pine: 30.2 acres (0.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 362.8 acres (8.8%)</td>
</tr>
<tr>
<td>11</td>
<td>High Elevation Subalpine Fir (with Whitebark Pine)</td>
<td>342.9</td>
<td>342.3</td>
<td>0.7</td>
<td>• Burned Herblands: 35.1 acres (10.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.2%)</td>
<td>(99.8%)</td>
<td>(0.2%)</td>
<td>• Burned Sparse Vegetation: 174.0 acres (53%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Lodgepole Pine: 11.2 acres (3.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Riparian Herblands: 6.7 acres (2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Subalpine Fir: 71.5 acres (21.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Whitebark Pine: 21.9 acres (6.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• All others: 28.1 acres (7.6%)</td>
</tr>
<tr>
<td>97, 98, 99</td>
<td>Water, Rock and Barren, Non-Forest</td>
<td>2,814.9</td>
<td>2,078.6</td>
<td>736.3</td>
<td>• Not vegetation; analysis of impacts to PVGs are not performed on these categories.</td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td>15,440.0</td>
<td>14,313.9</td>
<td>1,126.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(100%)</td>
<td>(92.7%)</td>
<td>(7.3%)</td>
<td></td>
</tr>
</tbody>
</table>


1 Percentages in this column represent percent of the total analysis area acreage where PVG data are available.
2 Percentages in this column represent percent of the total acres for this PVG.
3 Disturbed areas are those impacted by historical mine-related activities.
4 Acreages for all existing vegetation types that compose greater than 5 percent of total cover in a PVG, as well as total acres for uncommon vegetation types of any percent cover.
5 Totals and percentages don't necessarily equal the total acres in the analysis area due to non-forest service land not having existing vegetation data available.
6 Due to rounding, numbers presented may not sum precisely to the totals provided.
### Table 3.10-2  Acres of Existing Vegetation Types in Areas Identified as Not Successional to Forested PVGs in the Analysis Area within Forest Service-administered Land

<table>
<thead>
<tr>
<th>Existing Vegetation Type</th>
<th>Acres¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>3.9 (0.25%)</td>
</tr>
<tr>
<td>Aspen</td>
<td>1.4 (&lt;0.1%)</td>
</tr>
<tr>
<td>Burned Forest Shrublands</td>
<td>40.6 (2.53%)</td>
</tr>
<tr>
<td>Burned Herblands</td>
<td>76.5 (4.77%)</td>
</tr>
<tr>
<td>Burned Sparse Vegetation</td>
<td>60.2 (3.75%)</td>
</tr>
<tr>
<td>Developed</td>
<td>574.1 (35.791%)</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>205.6 (12.82%)</td>
</tr>
<tr>
<td>Douglas-fir/Lodgepole Pine</td>
<td>17.6 (1.1%)</td>
</tr>
<tr>
<td>Douglas-fir/Ponderosa Pine</td>
<td>25.6 (1.6%)</td>
</tr>
<tr>
<td>Engelmann’s Spruce</td>
<td>2.8 (0.17%)</td>
</tr>
<tr>
<td>Forblands</td>
<td>11.8 (0.73%)</td>
</tr>
<tr>
<td>Forest Shrublands</td>
<td>30.0 (1.87%)</td>
</tr>
<tr>
<td>Grasslands</td>
<td>39.4 (2.45%)</td>
</tr>
<tr>
<td>Lodgepole Pine</td>
<td>229.8 (14.33%)</td>
</tr>
<tr>
<td>Mountain Big Sagebrush</td>
<td>13.8 (0.86%)</td>
</tr>
<tr>
<td>Mountain Shrubland</td>
<td>7.1 (0.44%)</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>48.5 (3.02%)</td>
</tr>
<tr>
<td>Riparian Herblands</td>
<td>46.9 (2.92%)</td>
</tr>
<tr>
<td>Riparian Shrublands/Deciduous Forests</td>
<td>53.0 (3.30%)</td>
</tr>
<tr>
<td>Sparse Vegetation</td>
<td>57.8 (3.60%)</td>
</tr>
<tr>
<td>Subalpine Fir</td>
<td>34.7 (2.16%)</td>
</tr>
<tr>
<td>Water</td>
<td>20.1 (1.25%)</td>
</tr>
<tr>
<td>Western larch</td>
<td>0.1 (&lt;0.1%)</td>
</tr>
<tr>
<td>Whitebark Pine</td>
<td>2.8 (0.17%)</td>
</tr>
<tr>
<td>No existing vegetation mapped²</td>
<td>6.3 (0.6%)</td>
</tr>
<tr>
<td><strong>TOTAL³</strong></td>
<td>1,603.9</td>
</tr>
</tbody>
</table>


¹Percentages in this column represent percent of the total acres.

²Vegetation community impacts analyses performed on areas where vegetation is mapped.

³Due to rounding, numbers presented in this table may not sum precisely to the total provided.

### Vegetation Communities in the Analysis Area outside Forest Service-Managed Land

As PVG mapping does not extend outside the boundaries of the PNF or BNF, LANDFIRE vegetation mapping was used to describe vegetation outside Forest Service-administered lands. Approximately 3,046 acres (18 percent) of land in the vegetation analysis area occurs on lands not administered by the Forest Service. Acres of LANDFIRE vegetation communities (excluding developed or urban land uses) in the analysis area outside Forest Service-administered lands are presented in Table 3.10-3. Descriptions and
maps of these vegetation communities are presented in Appendix B of the SGP Vegetation Specialist Report (Forest Service 2022g).

### Table 3.10-3 Vegetation Communities in the Analysis Area outside Forest Service-administered Land

<table>
<thead>
<tr>
<th>LANDFIRE Vegetation System Group</th>
<th>LANDFIRE Vegetation Class Name</th>
<th>Acres¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conifer</td>
<td>Middle Rocky Mountain Montane Douglas-fir Forest and Woodland</td>
<td>11.4 (0.4%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest</td>
<td>433.9 (14.2%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Foothill Conifer Wooded Steppe</td>
<td>1.1 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Mesic Montane Mixed Conifer Forest</td>
<td>35.4 (1.2%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Ponderosa Pine Woodland and Savanna</td>
<td>109.6 (3.6%)</td>
</tr>
<tr>
<td></td>
<td>Rocky Mountain Lodgepole Pine Forest</td>
<td>101.0 (3.3%)</td>
</tr>
<tr>
<td></td>
<td>Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland</td>
<td>0.5 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland</td>
<td>0.4 (&lt;1%)</td>
</tr>
<tr>
<td>Exotic Herbaceous</td>
<td>Interior Western North American Temperate Ruderal Grassland</td>
<td>482.7 (15.8%)</td>
</tr>
<tr>
<td>Exotic Tree-Shrub</td>
<td>Interior Western North American Temperate Ruderal Shrubland</td>
<td>62.3 (2.1%)</td>
</tr>
<tr>
<td>Grassland</td>
<td>Rocky Mountain Subalpine-Montane Mesic Meadow</td>
<td>18.7 (0.6%)</td>
</tr>
<tr>
<td>Riparian</td>
<td>North American Arid West Emergent Marsh</td>
<td>0.2 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Lower Montane Riparian Shrubland</td>
<td>51.8 (1.7%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Lower Montane Riparian Woodland</td>
<td>114.0 (3.7%)</td>
</tr>
<tr>
<td></td>
<td>Rocky Mountain Alpine-Montane Wet Meadow</td>
<td>480.5 (15.8%)</td>
</tr>
<tr>
<td>Shrubland</td>
<td>Inter-Mountain Basins Big Sagebrush Steppe</td>
<td>0.6 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>Inter-Mountain Basins Montane Sagebrush Steppe</td>
<td>9.3 (0.3%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Montane-Foothill Deciduous Shrubland</td>
<td>53.3 (1.8%)</td>
</tr>
<tr>
<td></td>
<td>Northern Rocky Mountain Subalpine Deciduous Shrubland</td>
<td>9.6 (0.3%)</td>
</tr>
<tr>
<td>Sparsely Vegetated</td>
<td>Rocky Mountain Cliff Canyon and Massive Bedrock</td>
<td>10.4 (0.3%)</td>
</tr>
<tr>
<td>Open Water</td>
<td>Open Water</td>
<td>52.3 (1.7%)</td>
</tr>
<tr>
<td>Agricultural, Developed</td>
<td>All others</td>
<td>1,007.5 (33.1%)</td>
</tr>
<tr>
<td>TOTAL³</td>
<td></td>
<td>3,046.4 (100%)</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; LANDFIRE 2016

¹Percentages in this column represent percent of the total acres.

²Vegetation community impacts analyses performed solely on non-agriculture and non-developed vegetation communities.

³Due to rounding, numbers presented in this table may not sum precisely to the total provided.
Vegetation Community Trends

On the PNF, from 1989 to 2016, an average of 178 fires occurred annually with a majority of them caused by lightning. Approximately 59 percent of the PNF was affected by fire between 1989 and 2016, consisting of a mix of both characteristic and uncharacteristic fires depending upon the historic fire regime (Forest Service 2003a, 2017f). On the BNF, from 1989 to 2016, an average of 151 fires occurred annually with a majority of them caused by lightning, over 58 percent of the planning unit land base has burned between 1989 and 2016, and even though acres burned by wildfire have been increasing over the past few decades, the amount of area burned is still well below historical levels (Forest Service 2010a, 2016h). Near the vegetation analysis area, past fires within the headwaters of the East Fork SFSR and Sugar Creek include Indian Creek Point (12,206 acres); Tamarack (2,291 acres); Bishop Creek (1,452 acres); Cascade Complex (302,530 acres); and Thunder City (9,475 acres).

The effects of fire on the landscape vary depending on weather, fuel loadings, and vegetative community type. Historically, wildfires throughout the PNF and BNF ranged from ground fires to stand-replacing fires, depending on the vegetative community. Some recent wildfires have created more homogeneous landscapes than those that typically occurred within historical fire regimes. However, some recent fires in the PNF and BNF may have been more similar to historical fires in that they burned through vegetative types that historically burned infrequently, resulting in a diversity of vegetative communities and a variety of landscape mosaics (Forest Service 2003a, 2010d). Due to the complexity of the current fire regime within the analysis area, it is difficult to predict how changes in vegetation communities at the SGP may impact future fires in the analysis area.

Additionally, various factors including altered species compositions have increased the susceptibility of some plant communities to large-scale infestations of insects and pathogens, which has resulted in greater numbers of standing dead or dying trees and increases the fuel loading in these areas (Forest Service 2003a).

Gradual changes in the distribution and abundance of dominant plant species and short-term impacts on vegetation structure and age classes are expected as a result of rising temperatures and longer and more frequent droughts associated with climate change (Halofsky et al. 2017).

Surface soils in the SGP area are influenced by trace metals as a byproduct of legacy mine operations, with concentrations of antimony, arsenic, mercury, and silver in soils adjacent to the SGP being greater than screening level phytotoxicity criteria (Tetra Tech 2021a). Total arsenic was identified as having the greatest potential to cause phytotoxicity in plants growing at or near the SGP. However, soil analysis and visual observations of plant growth in reclaimed historic mine sites adjacent to the SGP suggest that plants in the area can withstand higher concentrations of trace metals than are commonly accepted as upper limits for supporting vegetation (Tetra Tech 2021a).

Desired Conditions for Vegetation

- Generalized desired conditions relating to vegetation communities in the Payette Forest Plan and Boise Forest Plan are described below. More specific desired conditions for the different components of vegetation are found in Appendix A of the Forest Plans.
Both Forest Plans: Forested vegetation reflects a combination of successional development, disturbance regimes, and management activities. Forested lands exhibit variable patterns of size classes, densities, structural stages, and species composition. Seral tree species such as ponderosa pine, Douglas-fir, aspen, and whitebark pine have increasing species composition in areas where fire and mechanical vegetation treatments are the primary tools. Snags and coarse woody debris are present in sufficient quantities to provide for habitat diversity and long-term soil productivity.

Grasslands and shrublands exhibit variable patterns of multiple-aged shrubs, grasses, and forbs. Shrublands are found in mosaics of canopy closures across the landscape, reflecting a combination of successional development, disturbance regimes and management activities. Some mid- to high-elevation grasslands are primarily meadow complexes that are dominated by sedges, rushes, grasses, and forbs.

Payette Forest Plan only: Where vegetation development is dominated by plant succession, climax species composition is increasing, canopy cover densities are moderate to high, and late successional structure develops.

Boise Forest Plan only: In areas where vegetation development evolves primarily as a result of plant succession rather than disturbance, late-seral/climax species composition and moderate to high canopy densities will increase.

### 3.10.4.2 Botanical Resources

The terms botanical resources or special status plants are generally used to denote species that are considered sufficiently rare that they require special consideration and/or protection by the federal and/or state governments. For the purposes of this section, botanical resources or special status plant species are those that are:

- Listed as threatened or endangered under the ESA, as amended (16 USC 35 Section 1531 et seq. 1988);
- Identified as candidate or proposed for ESA listing;
- Designated as sensitive on the Regional Foresters list; and/or
- Identified as forest watch plant species in the Payette Forest Plan (Forest Service 2003a) and/or Boise Forest Plan (Forest Service 2010a).

Sensitive species are defined in FSM 2670 as “plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by: 1) Significant current or predicted downward trends in population numbers or density and 2) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.”

Forest watch species are those that are confirmed to occur in the planning area for a Forest and are listed as S1, S2, or S3 (Table 3.10-4) at the state level and are not on the Forest Service regional sensitive species list. Impacts to forest watch species are addressed in adherence to Forest Service Guideline MIOB08 (Forest Service 2003a, 2010a).
Potential habitat modeling for special status plants in the analysis area was completed to supplement existing species location information. Potential habitat was modeled for whitebark pine and 29 additional Sensitive or Forest Watch species in the PNF and BNF; modeling protocols and results are documented in the SGP EIS Technical Report: Special Status Plant Potential Habitat Modeling Report (AECOM 2020e) and were updated in 2022 (Stantec 2022).

**Endangered Species Act Threatened, Endangered, Candidate, and Proposed Species**

There are no federally threatened, endangered, or candidate plant species documented or suspected in proximity to the analysis area. The whitebark pine (*Pinus albicaulis*) is a federally proposed-threatened species known to occur in the analysis area and is discussed further below.

**Whitebark Pine**

The whitebark pine is a federally proposed-threatened species to be listed as threatened without proposed or designated Critical Habitat. On December 2, 2020, the USFWS published a proposed rule (85 FR 77408) to list the whitebark pine as a threatened species under the ESA of 1973, as amended (16 USC 1531 et seq.). Included in the proposed rule is a special rule pursuant to section 4(d) of the ESA that identifies actions necessary to conserve and recover the whitebark pine, as well as a limited number of prohibited acts (85 FR 77408). While the 4(d) rule does not relieve federal agencies of their obligations under section 7 of the Act, it includes exceptions that allow for optimal, flexible, and adaptive forest activities that can advance whitebark pine conservation.

This species is found in the analysis area (HDR 2017g; Tetra Tech 2020b; USFWS 2019a). Whitebark pine is a five-needled coniferous tree typically found in cold, windy, high-elevation or high-latitude sites in western North America, usually on steep slopes at alpine tree lines and in subalpine areas (Arno and Hoff 1989; BLM 2016; USFWS 2021). In moist mountain ranges, whitebark pine is most abundant on warm, dry exposures; but in semiarid ranges, it becomes prevalent on cool exposures and moist sites (Arno and Hoff 1989). It ranges from west-central British Columbia east to west-central Alberta and south to central Idaho, southwestern Wyoming, and southern California (NatureServe 2020a). Its distribution is split into two broad sections, one following the Coast Ranges and one following the Cascade Range, and the other following the northern Rocky Mountains, with scattered occurrences between the two sections in Great Basin regions of eastern Washington and Oregon and northern Nevada (NatureServe 2020a).

Whitebark pine is considered an important or keystone species in the ecosystems where it is found due to its function as habitat and food for wildlife, its ability to colonize areas after fire and other disturbances, its ability to survive on harsh, high-elevation droughty sites, and its function in regulating snowmelt and reducing soil erosion (Keane et al. 2017). Whitebark pine is a long-lived tree, commonly living over 400 years. Whitebark pine populations are declining in North America due to white pine blister rust disease (caused by the introduced pathogen white pine blister rust [*Cronartium ribicola]*) (85 FR 77408; Keane et al. 2017), historical and current mountain pine beetle (*Dendroctonus ponderosae*) outbreaks, and fire exclusion management policies. Climate change also is predicted to negatively affect whitebark pine as a result of warming temperatures and major shifts to disturbance regimes (Keane et al. 2017).
Special status plant surveys in which whitebark pine was among the targeted species were performed in 2012, 2013, and 2014 in portions of the analysis area (HDR 2017g). These surveys documented approximately 164 acres of whitebark pine at the SGP mine area and along Burnt Log Road (FR 447) and several existing roads, including Horse Heaven Road (FR 416w) and Meadow Creek Lookout Road (FR 51290), along the existing Old Thunder Mountain Road (FR 440), and within the transmission line corridor between Johnson Creek Road (CR 10-413) and the SGP mine area (HDR 2017g).

Forest Service botanists determined that the 2012, 2013, and 2014 whitebark pine surveys were not conducted throughout the extent of suitable habitat within the SGP footprint and data were not collected in a manner that would be useful for a comprehensive and meaningful effects analysis for this species. Therefore, Forest Service botanists requested that known habitat parameters be used to model potential habitat for whitebark pine (AECOM 2019a). Approximately 6,130 acres of potential habitat for this species was modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), the Burntlog Route, Meadow Creek Lookout Road (FR 51290), the transmission line right-of-way, and the SGP mine area.

Surveys for whitebark pine using potential habitat modeling developed in 2019 were performed in spring, summer, and fall of 2019. The results of these surveys are reported in the 2019 Whitebark Pine Survey Report (Tetra Tech 2020b). Approximately 2,069 acres of occupied whitebark pine habitat were identified within the analysis area for vegetation resources (i.e., Tetra Tech 2020b survey data within the 300-foot buffer on either side of all action alternative components). The 300-foot buffer was selected to encompass an area where direct and indirect impacts (e.g., dust, impacts to pollinators, etc.) from the action alternatives could impact vegetation.

**Sensitive and forest Watch Species**

Species Known to Occur in the Analysis Area

Two plant species designated as sensitive by the Forest Service are known to occur within or immediately adjacent to the analysis area. These species are least moonwort (*Botrychium simplex*) and Sacajawea’s bitterroot (*Lewisia sacajaweana*). Four forest watch species are known to occur within or immediately adjacent to the analysis area. These are bent-flowered milkvetch (*Astragalus vexilliflexus* var. *vexilliflexus*), Blandow’s helodium (*Helodium blandowii*), sweetgrass (*Hierochloe odorata*), and Rannoch-rush (*Scheuchzeria palustris*).

The state and global conservation status rank for each of these plants and Forest Service status as either a sensitive or forest watch species is presented in **Table 3.10-4**. State and global conservation status ranks are categorizations of the relative imperilment and rarity of a species at the state or global level (NatureServe 2012). Conservation status ranks do not have any regulatory authority but are useful in understanding the overall degree of vulnerability of a species to impacts that could occur from the SGP. More information for each of these species is presented below.
### Table 3.10-4  State and Global Rank and Forest Service Status for Special Status Plants Known to Occur Within or Immediately Adjacent to the Analysis Area

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>State Rank</th>
<th>Global Rank</th>
<th>Forest Service R4 Status</th>
<th>PNF Status</th>
<th>BNF Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Astragalus vexilliflexus</em> var. <em>vexilliflexus</em></td>
<td>Bent-flowered milkvetch</td>
<td>S1</td>
<td>G4T4</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
</tr>
<tr>
<td><em>Botrychium simplex</em></td>
<td>Least moonwort</td>
<td>S2</td>
<td>G5</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Forest Watch</td>
</tr>
<tr>
<td><em>Helodium blandowii</em></td>
<td>Blandow's helodium</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>Forest Watch</td>
</tr>
<tr>
<td><em>Hierochloe odorata</em></td>
<td>Sweetgrass</td>
<td>S1</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
</tr>
<tr>
<td><em>Lewisia sacajaweana</em></td>
<td>Sacajawea’s bitterroot</td>
<td>S2</td>
<td>G2</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td><em>Scheuchzeria palustris</em></td>
<td>Rannoch-rush</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
</tr>
</tbody>
</table>

Source: AECOM 2020e; Forest Service statuses and state ranks are from rare plant lists for the PNF (Forest Service no date) and BNF (Forest Service 2015a). Global ranks are from NatureServe Explorer database (NatureServe 2020b).

1State ranks are from rare plant lists for the PNF (Forest Service no date) and BNF (Forest Service 2015a). State ranks for species not on rare plant lists for the PNF or BNF and global ranks for all species are from NatureServe Explorer database (NatureServe 2020b).

S = State rank indicator; denotes rank based on status within Idaho.

G = Ranks designated at the global (or range-wide) level.

T = Infraspecific taxa (subspecies, plant varieties, and other designations below the level of the species) rank indicator, appended to the global rank for the including species.

1 = Critically imperiled — Typically having 5 or fewer occurrences, or 1,000 or fewer individuals.

2 = Imperiled — Typically having 6 to 20 occurrences, or 1,001 to 3,000 individuals.

3 = Vulnerable — Rare; typically having 21 to 100 occurrences, or 3,001 to 10,000 individuals.

4 = Apparently secure — Uncommon but not rare, but with some cause for long-term concern; typically having 101 or more occurrences, or 10,001 or more individuals.

5 = Secure — Common, widespread, abundant, and lacking major threats or long-term concerns.

2This column references a species’ status as sensitive on the Forest Service Region 4 (Intermountain Region) Proposed, Endangered, Threatened, and Sensitive Species List (Forest Service 2016c), regardless of whether this species is indicated on this list as being present in either the PNF or BNF.

3This column states if species is designated as sensitive or as a forest watch species according to the PNF rare plant list (Forest Service no date). *Botrychium simplex* is considered a sensitive plant species in the PNF even though the PNF rare plant list indicates it as a forest watch species (Forest Service 2020c).

4This column states if a species is designated as sensitive or as a forest watch species according to the BNF rare plant list (Forest Service 2015a). *Botrychium simplex* is considered a forest watch species in the BNF even though it is a sensitive species at the Region 4 level (Forest Service 2020d).

R4 = Species is designated as sensitive for the Forest Service Region 4 (Intermountain Region).

**Bent-flowered Milkvetch**

Bent-flowered milkvetch occurs over a range that extends from southern British Columbia and Alberta to southwestern Montana, western Wyoming, and Idaho, eastward to Saskatchewan and South Dakota (Mancuso 2016) (CPNWH 2018). Idaho populations occur on exposed, subalpine ridgelines in subalpine fir and whitebark pine parklands on subalpine ridges and upper slopes and all aspects (Mancuso 2016) from 7,500 to 8,500 feet (Forest Service no date). Vegetation in areas of known locations is very open with low ground cover (Mancuso 2016; Moseley 1994). The three occurrences of this species in Idaho all occur in the PNF planning area (Mancuso 2016).
Five subpopulations of a single occurrence (the Cinnabar Peak occurrence) of this species were
documented during surveys in 2012, 2013 (HDR 2017g), and 2016 (Mancuso 2016, IFWIS 2017). The
nearest subpopulation of the Cinnabar Peak occurrence extends from about 300 feet to one-quarter mile
upslope from and to the east of the West End Creek diversion. This subpopulation, which consists of an
estimated total of 7,000 to 10,000 plants, is about 25 acres in size and is located in a relatively
undisturbed area. This subpopulation is the largest contiguous area of occupied habitat for this species in
Idaho and is considered to be critical to the long-term viability of this species, as it could serve as seed
sources for future conservation efforts. The other subpopulations of this occurrence and the other
occurrences of this species are located outside the analysis area for the SGP. These subpopulations and
occurrences are all smaller in extent and population size than the Cinnabar Peak subpopulation of the
Cinnabar Peak occurrence (Mancuso 2016).

**Least Moonwort**

Least moonwort occurs throughout the Rocky Mountain Range in British Columbia, Alberta,
Washington, Oregon, Idaho, Montana, and Wyoming; Cascade Range in Washington, Oregon, and
California; and Sierra Nevada Range in California (CPNWH 2018). Least moonwort is found in a variety
of habitats including meadows, forests, and roadside areas (Colorado Natural Heritage Program 2006;
Forest Service 2015a, no date), dry fields, marshes, bogs, swamps, and roadside ditches, usually in areas
with subacid soils (NatureServe 2020c).

Two subpopulations of a single occurrence of least moonwort occur in swales adjacent to Johnson Creek
Road. However, these subpopulations were last observed in 2004 and had estimated population sizes of
approximately 360 plants in each subpopulation (IFWIS 2017) but were not observed by Forest Service
surveyors in the most recent survey year (2005) (IFWIS 2017). This species was not included in past
SGP-related surveys in 2012, 2013, or 2014 (HDR 2017g).

**Blandow’s Helodium**

Blandow’s helodium occurs in the Rocky Mountain, Cascade, Alaska, and Brooks ranges in Alaska, and
in the provinces of Yukon, British Columbia, and Alberta in Canada and in Washington, Oregon,
Montana, Idaho, and Wyoming (CPNWH 2018). Habitat for this species is mats and hummocks in
montane peatlands, fens, and bogs, and under sedges and shrubs or along streams in mires (Forest Service
2015a). It occurs in wetlands and along streams between 3,900 to 6,600 feet elevation in and at edges of
conifer forests on the eastside of the PNF (Forest Service no date). It forms in mats and small hummocks
in medium to rich montane fens with calcareous groundwater and sometimes occurs under sedges and
shrubs around the edges of fens or along streamlets in fens (Forest Service 2007b).

A single occurrence of Blandow’s helodium occurs in the analysis area near Trapper Creek approximately
100 feet from where the Burntlog Route would cross the Trapper Flat wetland (IFWIS 2017). This
occurrence was last observed in 2004 and consists of an unknown number of individuals (IFWIS 2017)
and was not included in past SGP-related surveys in 2012, 2013, or 2014 (HDR 2017g).
**Sweetgrass**

The range for sweetgrass is the Rocky Mountain, Cascade, Alaska, and Brooks ranges in Alaska (including Seward Peninsula), the provinces of Yukon, British Columbia, and Alberta in Canada, and the states of Washington, Oregon, Montana, Idaho, Wyoming, and Utah (CPNWH 2018). Its habitat is described as moist slopes, meadows, and streambanks from the foothills to subalpine elevations (Forest Service 2015a), moist soil of lower montane to subalpine meadows and slopes (Hitchcock and Cronquist 1973), and edges of sloughs and marshes, bogs, shaded streambanks, lakeshores, and cool mountain canyons (Walsh 1994).

A single occurrence of sweetgrass is found in the analysis area in the wetlands near Trapper Creek, approximately 780 feet to over 1,000 feet from where the proposed Burntlog Route would cross the Trapper Flat wetland area (IFWIS 2017). The location of this species is hydrologically connected to the proposed location of the proposed new road through the wetlands around Trapper Creek under the 2021 MMP and is thus considered to be within the analysis area. This occurrence was last observed in 2004 and consists of an unknown number of individuals (IFWIS 2017). This species was not included in past SGP-related surveys in 2012, 2013, or 2014 (HDR 2017g).

**Sacajawea’s Bitterroot**

The range for Sacajawea’s bitterroot is the Rocky Mountains in Idaho (CPNWH 2018), with roughly three-fourths of the populations occurring on the BNF (Forest Service 2014a).

Sacajawea’s bitterroot inhabits relatively sparsely vegetated upper slopes and ridgetops in montane and subalpine habitats on the PNF and some areas of the BNF (Forest Service 2015a; NatureServe 2020d) in areas with fractured bedrock and granitic soils near late snowbanks at elevations of between 5,400 to 9,500 feet (Forest Service 2015a). Vegetation communities around existing populations are mostly bare subalpine woodlands and open ridges, but it also is known to occur in Ponderosa pine habitat on the BNF from 4,500 to 6,500 feet (Forest Service no date).

A single occurrence of Sacajawea’s bitterroot occurs in the analysis area approximately 300 feet above Warm Lake Road and the existing transmission line corridor near the intersection of Warm Lake Road and Curtis Creek Road. This occurrence was last observed in 1999 and has an unknown number of individuals (IFWIS 2017). This occurrence was not documented by surveyors in 2014 although this species was targeted during surveys that year (HDR 2017g).

**Rannoch-rush**

The range for Rannoch-rush is from the Rocky Mountain, Alaska, and Cascade ranges in Alaska, the Canadian provinces of Yukon and British Columbia, and the states of Washington, Oregon, Idaho, and Montana (CPNWH 2018). Its habitat is full sun areas in sphagnum bogs and peatlands (NatureServe 2020e) (Forest Service 2015a).
A single occurrence of this species has been documented in the analysis area by the IDFG in the Mud Lake area (IDFG 2004; IFWIS 2017) approximately 200 feet from an existing portion of Burnt Log Road (FR 447). This occurrence was last observed in 2001 and has an unknown number of individuals (IFWIS 2017). This species was not included in past SGP-related surveys in 2012, 2013, or 2014 (HDR 2017g).

**Species with the Potential to Occur in the Analysis Area**

Modeled potential habitat (as well as mapped occupied habitat for the whitebark pine) for Forest Service-designated sensitive or forest watch species occurs on 19,492.4 acres in the analysis area, all within the boundaries of the PNF and BNF. Areas of modeled potential habitat occur on approximately 38 percent of the analysis area or 60 percent, and 2 percent of lands administered by the PNF, BNF, and Salmon-Challis NF, respectively.

**Table 3.10-5** presents a list of the 29 sensitive or forest watch species that have the potential to occur in the analysis area and for which habitat modeling was performed. Modeling methods, results, and rationale for determining that these species have potential to occur in the analysis area are presented in the SGP EIS Technical Report: Special Status Plant Potential Habitat Modeling Report (AECOM 2020e) and updated in 2022 (Stantec 2022). This table also presents information on whether past surveys have been completed for these species, any populations within or near the analysis area, and the extent and general area of modeled potential habitat for these species within the analysis area.
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>State Rank</th>
<th>Global Rank</th>
<th>Forest Service R4 Status</th>
<th>PNF Status</th>
<th>BNF Status</th>
<th>Populations and Past Surveys in Analysis Area</th>
<th>Extent of Modeled Potential Habitat in the Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allotropa virgata</em></td>
<td>Candystick</td>
<td>S3</td>
<td>G4</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>--</td>
<td>No known occurrences in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>389.9 acres of potential habitat are modeled near the SGP mine area, the transmission line route, Burntlog Route, Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), and Johnson Creek Road (CR 10-413).</td>
</tr>
<tr>
<td><em>Astragalus vexilliflexus</em> var. <em>vexilliflexus</em></td>
<td>Bent-flowered milkvetch</td>
<td>S1</td>
<td>G4T4</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>Four subpopulations of a single occurrence of this species are located near the SGP mine area (Mancuso 2016), one of which extends from approximately one-quarter mile to around 300 feet upslope from and to the east of the West End Creek diversion. This species was targeted during surveys in 2012, 2013 (HDR 2017g), and 2016 (Mancuso 2016).</td>
<td>122.6 acres of potential habitat are modeled near the SGP, the transmission line route, and Meadow Creek Lookout Road (FR 51290).</td>
</tr>
<tr>
<td><em>Botrychium crenulatum</em></td>
<td>Scalloped moonwort</td>
<td>S1</td>
<td>G4</td>
<td>Sensitive</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known populations in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>73.5 acres of potential habitat are modeled along Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road portion of the McCall-Stibnite Road (CR 50-412), the transmission line corridor, and the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank¹</td>
<td>Global Rank¹</td>
<td>Forest Service R4 Status²</td>
<td>PNF Status³</td>
<td>BNF Status⁴</td>
<td>Populations⁵ and Past Surveys in Analysis Area⁶</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area⁷</td>
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</tr>
<tr>
<td><em>Botrychium lineare</em></td>
<td>Slender moonwort</td>
<td>SH</td>
<td>G2</td>
<td>Sensitive</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>837.6 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Botrychium simplex</em></td>
<td>Least moonwort</td>
<td>S2</td>
<td>G5</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Forest Watch</td>
<td>Two subpopulations of a single occurrence of this species occur in swales adjacent to Johnson Creek Road (IFWIS 2017) but this population wasn’t observed by Forest Service surveyors in 2005 and therefore may not still be present. This species has not been included in past special status plant surveys for the SGP.</td>
<td>837.6 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Bryum calobryoides</em></td>
<td>Beautiful Bryum</td>
<td>SH⁵</td>
<td>G3</td>
<td>Sensitive</td>
<td>--</td>
<td>Sensitive</td>
<td>No known occurrences in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>27.6 acres of potential habitat are modeled along Stibnite Road (CR 50-412), Johnson Creek Road (CR 10-413), Burntlog Route, and Warm Lake Road (CR 10-579).</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations and Past Surveys in Analysis Area</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area</td>
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</tr>
<tr>
<td><em>Buxbaumia viridis</em></td>
<td>Green bug moss</td>
<td>S3</td>
<td>G4/G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>338.0 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), and at the SGP mine area.</td>
</tr>
<tr>
<td><em>Calamagrostis tweedyi</em></td>
<td>Cascade reedgrass</td>
<td>S2</td>
<td>G3</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>--</td>
<td>No known occurrences in the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>3,883.6 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Carex livida</em></td>
<td>Livid sedge</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>849.4 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, McCall-Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Carex straminiformis</em></td>
<td>Shasta sedge</td>
<td>S3</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>816.1 acres of potential habitat are modeled along Burntlog Route, Old Thunder Mountain Road (FR 440), Meadow Creek Lookout Road (Forest Road 51290), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations and Past Surveys in Analysis Area</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area</td>
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<tr>
<td><em>Cicuta bulbifera</em></td>
<td>Bulblet-bearing water hemlock</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
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<td></td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>1,086.9 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Douglasia idahoensis</em></td>
<td>Idaho douglasia</td>
<td>S3</td>
<td>G3</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>One occurrence of this species occurs approximately 0.25 mile north of Warm Lake Road in an area west of Warm Lake (IFWIS 2017), which is outside the analysis area. This species was not documented by surveyors in 2014 although it was targeted during surveys that year (HDR 2017g).</td>
<td>175.8 acres of potential habitat are modeled along Burntlog Route, Meadow Creek Lookout Road (FR 51290), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Draba incerta</em></td>
<td>Yellowstone draba</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>338.7 acres of potential habitat are modeled along Burntlog Route, Meadow Creek Lookout Road (FR 51290), Old Thunder Mountain Road (FR 440), the transmission line route, and at the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations and Past Surveys in Analysis Area</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area</td>
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</tr>
<tr>
<td><em>Drosera intermedia</em></td>
<td>Spoonleaf sundew</td>
<td>S1</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>849.4 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), Meadow Creek Lookout Road (FR 51290), Old Thunder Mountain Road (FR 440), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Epilobium palustre</em></td>
<td>Swamp willow weed</td>
<td>S3</td>
<td>G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>72.8 acres of potential habitat are modeled along Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and at the SGP mine area.</td>
</tr>
<tr>
<td><em>Epipactis gigantea</em></td>
<td>Giant helleborine orchid</td>
<td>S2 S3</td>
<td>G3G4</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>32.8 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), and Stibnite Road (CR 50-412).</td>
</tr>
<tr>
<td><em>Helodium blandowii</em></td>
<td>Blandow's helodium</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>Forest Watch</td>
<td>One occurrence of this species is located near Trapper Creek within 300 feet of the Burntlog Route (IFWIS 2017). This species has not been included in past special status plant surveys for the SGP.</td>
<td>705.0 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and at the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations and Past Surveys in Analysis Area</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area</td>
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<tr>
<td><em>Hierochloe odorata</em></td>
<td>Sweetgrass</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td></td>
<td>Forest Watch</td>
<td>995.5 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 0-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and at the SGP mine area.</td>
</tr>
<tr>
<td><em>Lewisia sacajaweana</em></td>
<td>Sacajawea’s bitterroot</td>
<td>S2</td>
<td>G2</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>One occurrence of this species is located approximately 300 feet above Warm Lake Road and the existing transmission line corridor near the intersection of Warm Lake Road with Curtis Creek Road (IFWIS 2017). This occurrence was not documented by surveyors in 2014 although this species was targeted during surveys that year (HDR 2017g).</td>
<td>2,351.7 acres of potential habitat are modeled along Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations and Past Surveys in Analysis Area</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area</td>
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</tr>
<tr>
<td><em>Mimulus clivicola</em></td>
<td>Bank monkeyflower</td>
<td>S3</td>
<td>G4</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>404.0 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Penstemon laxus</em></td>
<td>Tufted penstemon</td>
<td>S2</td>
<td>G2</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>320.1 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), and at the SGP mine area.</td>
</tr>
<tr>
<td><em>Polystichum kruckebergii</em></td>
<td>Kruckeberg’s Sword-fern</td>
<td>S2</td>
<td>G4</td>
<td>--</td>
<td>Forest Watch</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>1,053.2 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td><em>Rhynchospora alba</em></td>
<td>White beaksedge</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>426.4 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank¹</td>
<td>Global Rank¹</td>
<td>Forest Service R4 Status²</td>
<td>PNF Status³</td>
<td>BNF Status⁴</td>
<td>Populations⁵ and Past Surveys in Analysis Area⁶</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area⁷</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------------------</td>
<td>-------------</td>
<td>------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Sanicula graveolens</td>
<td>Sierra sanicle</td>
<td>S2</td>
<td>G4G5</td>
<td>--</td>
<td>Forest Watch</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>802.0 acres of potential habitat are modeled along Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Saxifraga tolmiei var. ledifolia</td>
<td>Tolmie's saxifrage</td>
<td>SNR</td>
<td>G5</td>
<td>Sensitive</td>
<td>--</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>690.7 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Johnson Creek Road (CR 10-413), Burntlog Route, the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Scheuchzeria palustris</td>
<td>Rannoch-rush</td>
<td>S2</td>
<td>G5</td>
<td>--</td>
<td>--</td>
<td>Forest Watch</td>
<td>An occurrence of this species has been documented by Idaho Department of Fish and Game in the Mud Lake area (Idaho Department of Fish and Game 2004; IFWIS 2017) within 300 feet of an existing portion of Burnt Log Road (FR 447). This species has not been included in past special status plant surveys for the SGP.</td>
<td>849.4 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>State Rank</td>
<td>Global Rank</td>
<td>Forest Service R4 Status</td>
<td>PNF Status</td>
<td>BNF Status</td>
<td>Populations5 and Past Surveys in Analysis Area6</td>
<td>Extent of Modeled Potential Habitat in the Analysis Area7</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------------------------</td>
<td>------------</td>
<td>------------</td>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Sedum borschii</td>
<td>Borsch’s stonecrop</td>
<td>S2</td>
<td>G4</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>A single historical occurrence of this species is located in the analysis area. This occurrence was not found the last time it was surveyed for (1983). This species has not been included in past special status plant surveys for the SGP.</td>
<td>98.1 acres of potential habitat are modeled along Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Sedum leibergii</td>
<td>Leiberg stonecrop</td>
<td>S2</td>
<td>GNR</td>
<td>--</td>
<td>Forest Watch</td>
<td>--</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>98.1 acres of potential habitat are modeled along Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
<tr>
<td>Triantha occidentalis ssp. brevistyla</td>
<td>Short-style tofieldia</td>
<td>S1</td>
<td>G5T4</td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Forest Watch</td>
<td>No known occurrences in or near the analysis area. This species has not been included in past special status plant surveys for the SGP.</td>
<td>531.8 acres of potential habitat are modeled along Warm Lake Road (CR 10-579), Cabin Creek Road (FR 50467), Johnson Creek Road (CR 10-413), Burntlog Route, Stibnite Road (CR 50-412), the transmission line route, and the SGP mine area.</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Refer to AECOM 2020e and Stantec 2022 for rationale used in determining presence or absence of potential habitat for species in the analysis area.

1State ranks are from rare plant lists for the PNF (Forest Service no date) and BNF (Forest Service 2015a). State ranks for species not on rare plant lists for the PNF or BNF and global ranks for all species are from NatureServe Explorer database (NatureServe 2020b).

S = State rank indicator; denotes rank based on status within Idaho.; G = Ranks designated at the global (or range-wide) level.; T = Infraspecific taxa (subspecies, plant varieties, and other designations below the level of the species) rank indicator, appended to the global rank for the including species. 1 = Critically imperiled — Typically having 5 or fewer occurrences, or 1,000 or fewer individuals. 2 = Imperiled — Typically having 6 to 20 occurrences, or 1,001 to 3,000 individuals. 3 = Vulnerable — Rare; typically having 21 to 100 occurrences, or 3,001 to 10,000 individuals. 4 = Apparently secure — Uncommon but not rare, but with some cause for long-term concern; typically having 101 or more occurrences, or 10,001 or more individuals.

5 = Secure — Common, widespread, abundant, and lacking major threats or long-term concerns.
H = Historical occurrence (i.e., formerly part of the native biota; implied expectation that it might be rediscovered or possibly extinct).
NR = Not ranked.
2This column references a species’ status as sensitive on the Forest Service Region 4 (Intermountain Region) Proposed, Endangered, Threatened, and Sensitive Species List (Forest Service 2016c), regardless of whether this species is indicated on this list as being present in either the PNF or BNF.
3This column states if species is designated as sensitive or as a forest watch species according to the PNF rare plant list (Forest Service no date). Least moonwort (*Botrychium simplex*) is considered a sensitive plant species in the PNF even though the PNF rare plant list indicates it is a forest watch species (Forest Service 2020c).
4This column states if a species is designated as sensitive or as a forest watch species according to the BNF rare plant list (Forest Service 2015a). Scalloped moonwort (*Botrychium crenulatum*), least moonwort (*B. simplex*), and short-style tofieldia (*Triantha occidentalis* ssp. *brevistyla*) are considered forest watch species in the BNF even though they are designated as sensitive at the Region 4 level (Forest Service 2020d).
5Occurrence data for species were derived from IFWIS spatial data (IFWIS 2017).
6Refers to past SGP-related surveys performed by contractors for Midas Gold in 2012, 2013, and 2014 (HDR 2017g).
7Figures showing the modeled potential habitat for these species can be found in Appendix E of the Vegetation Specialist Report (Forest Service 2022g).
8Beautiful bryum (*Bryum calobryoides*) is ranked as a state historical species but was included in this analysis as a sensitive species in the BNF and its habitat conditions match those found in portions of the analysis area.
R4 = Species is designated as sensitive for the Forest Service Region 4 (Intermountain Region).
3.10.4.3 Non-Native Plants

Non-native plants are those that have been introduced by humans into an area where they are not native and that are able to establish on many sites, grow quickly, and spread to the point of disrupting plant communities or ecosystems, or whose introduction causes or is likely to cause economic or environmental harm or harm to human health (EO 13112). Noxious weeds are non-native plants designated by the Director of the Idaho State Department of Agriculture (ISDA) as having the potential to cause injury to public health, crops, livestock, land, or other property (Idaho Statute 22-2402). The ISDA is responsible for administering the State Noxious Weed Law in Idaho and maintains a list of noxious species. Noxious weeds are managed by the Forest Service on NFS lands with cooperation from ISDA and Tribal and County governments. Noxious weed categories are as follows:

- **Early Detection and Rapid Response** – Plants in this category must be reported to the ISDA within 10 days of being identified by an approved, qualified authority. Eradication must begin in the same season the species is found. No known species of Early Detection and Rapid Response are known in the subregion.

- **Containment** – The goal for these species is to reduce or eliminate new or small infestations and to manage established populations as determined by the weed control authority.

- **Control** – The goal for these species is to reduce or eliminate new or expanding weed populations. In some areas of the state, control or eradication is possible, and a plan must be written that will reduce infestations within 5 years.

Table 3.10-6 lists the noxious weeds and non-native plant species documented in the analysis area and surrounding area in Valley County, Idaho. Species in this table that have or have not been documented in the analysis area have the potential to spread from surrounding areas throughout the analysis area. Noxious weeds and non-native plants are commonly found along roads and in other areas disturbed by soil movement or vegetation clearing. Locations of non-native plant invasions as recorded by the Forest Service and Perpetua contractors (HDR 2017g) in the analysis area are shown in Appendix C of the SGP Vegetation Specialist Report (Forest Service 2022g). Spotted knapweed (Centaurea stoebe ssp. micranthos) and rush skeletonweed (Chondrilla juncea), both Containment species, are the most extensive in the analysis area and generally occur along roads (Forest Service 2019c).
### Table 3.10-6  Noxious Weeds and Non-Native Plant Species in Valley County and the Analysis Area

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Category</th>
<th>Where Known</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acroptilon repens</em></td>
<td>Russian knapweed</td>
<td>Noxious - Control</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Aegilops cylindrica</em></td>
<td>Jointed goatgrass</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Berteroa incana</em></td>
<td>Hoary alyssum</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Cardaria draba</em></td>
<td>Whitetop</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Carduus nutans</em></td>
<td>Musk thistle</td>
<td>Noxious - Control</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Centaurea diffusa</em></td>
<td>Diffuse knapweed</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Centaurea solstitialis</em></td>
<td>Yellow starthistle</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Centaurea stoebe ssp. micranthos</em></td>
<td>Spotted knapweed</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Chondrilla juncea</em></td>
<td>Rush skeletonweed</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Chrysanthemum leucanthemum</em></td>
<td>Oxeye daisy</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Cirsium arvense</em></td>
<td>Canada thistle</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Cirsium vulgare</em></td>
<td>Bull thistle</td>
<td>Non-native species</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Conium maculatum</em></td>
<td>Poison hemlock</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Convolvulus arvensis</em></td>
<td>Field bindweed</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Cynoglossum officinale</em></td>
<td>Houndstongue</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Euphorbia esula</em></td>
<td>Leafy spurge</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Hieracium aurantiacum</em></td>
<td>Orange hawkweed</td>
<td>Noxious- Control</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Hieracium caespitosum</em></td>
<td>Yellow hawkweed</td>
<td>Noxious- Early Detection and Rapid Response</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Hyoscyamus niger</em></td>
<td>Black henbane</td>
<td>Noxious- Control</td>
<td>Analysis area (not officially documented in Valley County)</td>
</tr>
<tr>
<td><em>Linaria dalmatica</em></td>
<td>Dalmatian toadflax</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Linaria vulgaris</em></td>
<td>Yellow toadflax</td>
<td>Noxious- Containment</td>
<td>Valley County; analysis area</td>
</tr>
<tr>
<td><em>Lythrum salicaria</em></td>
<td>Purple loosestrife</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Myriophyllum spicatum</em></td>
<td>Eurasian watermilfoil</td>
<td>Noxious- Control</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Onopordium acanthium</em></td>
<td>Scotch thistle</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Senecio jacobaea</em></td>
<td>Tansy ragwort</td>
<td>Noxious- Containment</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Sonchus arvensis</em></td>
<td>Perennial sowthistle</td>
<td>Noxious- Control</td>
<td>Valley County</td>
</tr>
<tr>
<td><em>Zygophyllum fabago</em></td>
<td>Syrian beancaper</td>
<td>Noxious- Early Detection and Rapid Response</td>
<td>Valley County</td>
</tr>
</tbody>
</table>

Source: AECOM 2020e; Forest Service 2019c; HDR 2017g; ISDA 2017; Prather et al. 2016; Valley County 2019b.
3.11  Wetlands and Riparian Resources

3.11.1  Introduction

This section describes the existing conditions of wetland and riparian resources in the analysis area. It presents an overview of general hydrologic conditions, followed by an inventory of existing wetlands, streams, open waters, and riparian areas. Wetland functions and values in the analysis area for wetlands is also described. Additional details and information can be found in the SGP Wetlands and Riparian Resources Specialist Report (Forest Services 2022h).

3.11.2  Wetlands and Riparian Resources Area of Analysis

The analysis area for wetland and riparian resource includes the area where effects (direct/indirect and cumulative) may be caused by the proposed activities (FSH.1909.15, 15.2a). The analysis area for direct/indirect effects is shown on Figure 3.11-1. It encompasses the following seven watersheds (HUC 10): Big Creek North Fork Payette River, Gold Fork River, Indian Creek, Johnson Creek, Lake Fork-North Fork Payette River, Upper East Fork SFSR, and Upper SFSR. Within these watersheds, the analysis area includes a mine site focus area and an off-site focus area, which includes off-site components of the SGP. Wetlands were not evaluated within the larger surrounding watersheds for the off-site corridors or areas not associated with the SGP.

3.11.3  Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to Wetland and Riparian Resources. Additional descriptions of these regulations can be found in the SGP Wetland and Riparian Resources Specialist Report (Forest Service 2022h).

Land and Resource Management Plan: The Payette Forest Plan and the Boise Forest Plan include management direction for wetlands and riparian areas. They include guidelines for RCAs, which are defined as “traditional riparian corridors, perennial and intermittent streams, wetlands, lakes, springs, reservoirs, and other areas where proper riparian functions and ecological processes are crucial to maintenance of the area’s water, sediment, woody debris, nutrient delivery system, and associated biotic communities and habitat.”

Aquatic resources on NFS lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. Desired conditions are descriptions of how forest resources should look and function to provide diverse and sustainable habitats, settings, goods, and services. Taken together, the desired conditions should present an integrated vision of a properly functioning forest that supports a broad range of biodiversity and social and economic opportunities.

Clean Water Act: Federal regulations governing discharges of dredged or fill material into WOTUS, including wetlands, streams, and open waters, are promulgated under Section 404 of the CWA, as administered by the USACE. Under Section 404 of the CWA; WOTUS, fall under the jurisdiction of the USACE. Thus, any discharge of dredged or fill material into jurisdictional wetlands or other WOTUS in the SGP area would require a DA Authorization.
Additionally, Section 404(b)(1) guidelines (Guidelines) promulgated by the EPA, in conjunction with the USACE, apply to an applicant’s proposed disposal site(s) for discharges of dredged or fill material into WOTUS. The Guidelines prohibit, for example, the authorization of a proposed discharge that would cause or contribute to the violation of an applicable water quality or toxic effluent standard or jeopardize a listed threatened or endangered species. The Guidelines also prohibit the authorization of a proposed discharge which will cause or contribute to significant degradation of the aquatic ecosystem. Findings of significant degradation must be based upon specific factual determinations, evaluations, and tests identified in the Guidelines. These include the evaluation of direct, indirect, and cumulative effects of the proposed discharge and alternatives on specific resources including fish, wildlife, and special aquatic sites.

These Guidelines state that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. The Guidelines also state that no discharge of dredged or fill material is permitted unless appropriate and practicable steps have been taken to minimize potential adverse effects to the aquatic ecosystem. Subpart H of the Guidelines identifies many possible steps to avoid, minimize, and compensate for direct and secondary adverse impacts. Taken together, these steps form the mitigation sequence: a mandatory, sequential process undertaken to “minimize potential adverse impacts of the discharge on the aquatic ecosystem.” Demonstrating compliance with the Guidelines requires identifying the appropriate and practicable steps that will be taken to avoid impacts, and then minimize and compensate for any remaining unavoidable impacts associated with discharges subject to the Guidelines.

For unavoidable impacts to wetlands, streams, and other WOTUS, the 404(b)(1) Guidelines require appropriate and practicable compensatory mitigation to offset unavoidable impacts. In 2008, the USACE and the EPA issued a final rule for Compensatory Mitigation for Losses of Aquatic Resources. This final rule contains the regulations that govern compensatory mitigation for activities that require a permit from the USACE (USACE and EPA 2008). Compensatory mitigation is defined as the restoration, establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts that remain after all appropriate and practicable avoidance and minimization has been achieved.

Section 402 of the CWA, which authorizes the NPDES permit program, controls water pollution by regulating point sources that discharge pollutants other than dredged and fill material into WOTUS. On June 5, 2018, EPA approved the IPDES Program and authorized the transfer of permitting authority to the state beginning on July 1, 2018.

Executive Order 11990: EO 11990 requires that federal agencies, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands, unless the head of the federal agency trying to work in wetlands finds that: 1) no practicable alternative to such construction exists; and 2) the project would include all practicable measures to minimize harm to wetlands that may result from such use (42 Federal Register 26961, 3 CFR 1977 Comp, p. 121).
State Regulations: Projects that may result in a discharge to WOTUS require Water Quality Certification under Section 401 of the CWA. Section 401 gives the authority to issue this certification, ensuring that the discharge complies with state water quality standards. The IDEQ is the regulatory authority for Section 401 permitting in Idaho. IDEQ must grant (with or without conditions), deny, or waive Section 401 certification for any project in Idaho that requires a federal permit or license under the CWA before the federal permit or license can be issued. This Water Quality Certification is made to ensure that a proposed project would comply with state water quality standards for surface water and any other water quality requirements under state law.

The IDWR regulates stream channels under the Idaho Stream Channel Protection Act. This act requires that a Stream Channel Alteration Permit be obtained from the IDWR before any type of alteration work, including removal and/or fill and installation of in-water or over-water structures with the potential to affect flow, within the beds and banks of a continuously flowing stream.

The Emergency Wetlands Resources Act of 1986 requires that states develop prioritized lists of wetlands that meet the criteria of 1) supporting rare or declining wetland types; 2) having identifiable threats of loss or degradation of wetland functions; and 3) having diverse and important functions and values (including recreation), or especially high value for specific functions. To meet the requirements of the Emergency Wetlands Resources Act, IDFG maintains a Wetland Conservation Prioritization Plan (IDFG 2012) and a list of wetland sites in need of acquisition for long-term conservation and management.

Valley County Regulations: Valley County reviews development proposals for consistency with the County’s Land Use Development Ordinance. When permits are required by other agencies for all or parts of the application, evidence of the permit and compliance with the provisions of the permit are to be a condition of the land use approval. This includes permits to alter wetlands, permits to construct in flood prone areas, and in other situations where the review and issuance of the permit would assure the Valley County Commission that the proposal would be technically feasible.

3.11.4 Affected Environment

3.11.4.1 General Hydrologic Landscape Setting

Operations Area Boundary

The main drainage basin in the Operations Area Boundary is the East Fork SFSR watershed (HUC 1706020802). The East Fork SFSR is joined by Johnson Creek near the village of Yellow Pine, downstream of the mine site. The SGP would be in several drainages that are all tributaries to the East Fork SFSR, including Meadow Creek, EFMC (also known as Blowout Creek), Garnet Creek, Fiddle Creek, Hennessy Creek, Midnight Creek, West End Creek, and Sugar Creek. Wetlands located on slopes and tributary drainages within and near the mine site area are associated with hillside seeps and springs (HydroGeo 2012b). In most cases, these seep and spring features are hydrologically connected to a larger wetland/stream complex in the valley floor and/or a stream downslope via surface flow (HDR 2017h). Snowmelt runoff and groundwater inputs also contribute to the hydrologic support of wetlands at the mine site.
As a result of almost a century of mining and exploration in the mine site area, numerous wetlands and streams have been altered, particularly those adjacent to former mine pits, tailing storage areas, and roads (Forest Service 1994). Previous mine operators excavated and/or filled wetlands to construct mineral processing facilities, development rock storage facilities, tailing storage facilities, mine access and haul roads, town sites, and other mining-related developments. Most of these activities occurred before enactment of the CWA in 1972 and associated mitigation requirements. Within the mine site focus area approximately 847 acres have been modified by past human activity and are considered highly disturbed. This area represents approximately 49 percent of the proposed disturbance for the SGP mine site area. The history of excavation and mine tailings storage at the mine site has introduced areas of soil contamination, which are often in, or adjacent to, wetlands and riparian areas (Midas Gold 2016a). Soils in areas where vegetation is removed or disturbed are more susceptible to wind and water erosion (Forest Service 1994). As such, in disturbed areas the water quality and soil stabilizing properties of intact wetlands and riparian areas make them especially important in maintaining and improving watershed conditions.

3.11.4.2 Off-Site Focus Area

SGP features in the off-site focus area portion of the analysis area would cross several watersheds: Upper East Fork SFSR (HUC 1706020802), Johnson Creek (HUC 1706020801), Upper SFSR (HUC 1706020804), Gold Fork River (HUC 1705012303), Big Creek North Fork Payette River (HUC 1705012305), Lake Fork-North Fork Payette River (HUC 1705012302), and Cascade Reservoir (HUC 1705012304). The Johnson Creek watershed drains to Johnson Creek, which flows northward. The Upper SFSR watershed drains to the SFSR, which flows northward. The Gold Fork River, Big Creek North Fork Payette River, Lake Fork-North Fork Payette River, and Cascade Reservoir watersheds all drain toward Cascade Lake and the North Fork Payette River.

The off-site focus area includes proposed access roads that would leave the mine site and travel west along East Fork SFSR, southwest along Burntlog Creek, and south along Johnson Creek towards Landmark. In these areas, wetlands along the roads include hillside seeps on slopes and valley-bottom riparian wetlands in narrow valleys (Forest Service 2010a).

The transmission line corridor would pass along hill tops located between the mine site and Johnson Creek Road (CR 10-413). The few wetlands in this area are generally limited to wetland seeps that act as the headwaters for ephemeral and intermittent streams. From the vicinity of Landmark, an existing transmission line continues west, crossing over hills and across stream valleys in the vicinity of Warm Lake. Approaching the City of Cascade, the general topography transitions from the Long Valley foothills down to the broad, Long Valley basin around Cascade Reservoir at 4,800 feet elevation. At this western end of the off-site focus area, the main geomorphic landforms are depositional plains with slope gradients averaging between 0 to 20 percent (Forest Service 2010a). Large, wide arrays of wetland and riparian habitat are located along the bottomlands surrounding the Cascade Reservoir (Forest Service 2010a). In many locations, aquatic habitats have been affected by roads, livestock grazing, timber harvest, and recreational use (Forest Service 2010a). Historical impacts include streambank erosion, degradation, rapid deposition of eroded sediments, and stream channel modification (Forest Service 2010a). Aquatic habitat is not functioning properly in some locations within the off-site focus area due to habitat fragmentation from roads and timber harvest, high sediment levels, and impacts to riparian areas (Forest Service 2010a).
3.11.4.3 Wetlands

Wetlands were identified and delineated using the methods described in Corps of Engineers Wetlands Delineation Manual (Corps Manual) (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region (Environmental Laboratory 2010; HDR 2017h). According to the Corps Manual, identification of wetlands is based on a three-factor approach involving indicators of hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987). Wetlands were further classified and described by their vegetation structure per the Classification of Wetlands and Deepwater Habitats (Cowardin et al. 1979) or as “Open Water.”

Table 3.11-1 provides a summary of the wetlands delineated within portions of the Mine Site and Off-site Focus Areas of the larger wetland analysis area broken out by Cowardin Classification as further described in the Wetland and Riparian Areas Specialist Report (Forest Service 2022h). See Section 3.10 Vegetation, for additional discussion of wetland vegetation characteristics in the analysis area, Section 3.5 for additional discussion of hydric soil conditions in the analysis area: and Sections 3.8 and 3.9 for additional information on surface water hydrology. Wetlands provide important ecological functions for associated streams and rivers. For example, they may protect fish by providing habitat during high flows, or they may remove nutrients and toxicants from waters to improve water quality in streams and rivers.

Table 3.11-1 Wetland Resources Identified in the Analysis Area – Totals

<table>
<thead>
<tr>
<th>Analysis Area</th>
<th>Palustrine Emergent (acres)</th>
<th>Palustrine Forested (acres)</th>
<th>Palustrine Scrub-shrub (acres)</th>
<th>Open Water (acres)</th>
<th>Total (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site Focus Area</td>
<td>128.8</td>
<td>157.7</td>
<td>136.9</td>
<td>5.4</td>
<td>428.8</td>
</tr>
<tr>
<td>Off-site Focus Area</td>
<td>1,438.9</td>
<td>178.2</td>
<td>187.8</td>
<td>333.6</td>
<td>2,138.6</td>
</tr>
<tr>
<td>Analysis Area (Total)</td>
<td>1,567.7</td>
<td>335.9</td>
<td>324.7</td>
<td>339.0</td>
<td>2,567.3</td>
</tr>
</tbody>
</table>

Any apparent discrepancies between totals are due to rounding of numbers.

Palustrine Emergent Wetland

The PEM wetland community is often present in large sedge meadows or associated with hillside seeps. Vegetation primarily consists of various grasses, sedges, moss, and forbs, such as swordfern rush (*Juncus ensifolius*), beaked sedge (*Carex rostrata*), Nebraska sedge (*Carex nebrascensis*), angelica (*Angelica arguta*), cow parsnip (*Heracleum lanatum*), Fendler’s meadow-rue (*Thalictrum fendleri*), horsetail (*Equisetum fluviatile* and *E. hyemale*), and monkeyflower (*Mimulus lewisii* and *M. guttatus*).

Palustrine Scrub-Shrub Wetland

The PSS wetland community commonly includes alder (*Alnus* spp.), willow (*Salix* spp.), bog birch (*Betula glandulosa*), and currant (*Ribes* spp.) in the shrub stratum, with an herbaceous understory consisting of grasses, sedges, and forbs such as swordfern rush, beaked sedge, horsetails, and monkeyflowers. A thick moss mat is common in the wettest scrub-shrub communities.
**Palustrine Forested Wetlands**

The PFO wetland community commonly includes Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and lodgepole pine (*Pinus contorta*) in the tree stratum (i.e., layer); alder, willows (*Salix boothii* and *S. drummondiana*), and currant in the shrub stratum; and various wetland forbs and grasses in the herb stratum.

**Fens**

Fens are permanently saturated PSS or PEM wetlands that form where a thick layer of partially decomposed organic matter, called peat, accumulates under water-soaked conditions (at least 8 to 16 inches within the upper 31.5 inches of the soil profile). Fens receive a significant portion of their hydrologic input and nutrients from water that has percolated through mineral soil and bedrock, and because of their unique characteristics, they tend to support a diverse plant and wildlife community. Fens range from poor fens, which are acidic (pH 4.0 to 5.5) and support more bog-type species (e.g., sphagnum moss), to rich fens, which are less acidic and are dominated by sedges, other graminoids, and true mosses (IDFG 2005a).

The wetland delineation and functional assessment surveys and reports prepared by HDR between 2011 and 2016 and amended by Tetra Tech in 2018 did not refer to any documented wetlands specifically as fens within areas surveyed. In 2017, Midas Gold reassessed the initial data collected by wetland delineators (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2016c) for the presence of fens and determined that the wetland datasheets did not indicate the presence of fens (Midas Gold 2017f). However, based on the indication of peat in soils at the TSF dam location and the adjacent TSF Buttress in geotechnical reports prepared for the SGP (SRK 2012; STRATA 2014a, 2014b, 2016, 2017; Tierra Group 2018), the Forest Service and USACE requested that Midas Gold reassess the sample plot datasheets from the wetland delineation surveys to determine if any wetlands encountered during those surveys had fen characteristics (e.g., appropriate geomorphic location, organic soils, prolonged near-surface water table, and associated plant species), and that Midas Gold provide a report to document the methods, data reviewed, and results of their reassessment. Midas Gold’s contractor (Tetra Tech) reviewed datasheets in the vicinity of the TSF and the adjacent TSF Buttress and determined that wetlands in these areas did not meet the characteristics of fens (Tetra Tech 2019b). Wetland delineation datasheets for other SGP component areas were not reassessed for the presence of potential fens as part of the Tetra Tech (2019) review.

IDFG considers wetlands associated with Mud Lake, Tule Lake, and Warm Lake, to be poor fens (IDFG 2004). Mud Lake and its associated wetlands are designated as a Class I site under the Wetland Conservation Prioritization Plan (IDFG 2012), indicating that this area is in near pristine condition and likely provides habitat for high concentrations of state rare plant or animal species (IDFG 2004). All these sites are within the analysis area for wetlands and riparian resources but outside of the construction footprint for the SGP. Mud Lake occurs near the existing Burnt Log Road (FR 447) and Warm Lake and Tule Lake occur south of Warm Lake Road (CR 10-579). For this analysis, wetlands associated with Mud Lake, Tule Lake, and Warm Lake are considered fens.
3.11.4.4 Streams and Riparian Areas

Riparian corridors are areas with distinctive soil and vegetation between a stream or other body of water and an adjacent upland, where elements of both aquatic and terrestrial ecosystems mutually influence each other (Forest Service 2003a; Knutson and Naef 1997). Riparian areas often overlap with wetlands and the portions of floodplains and valley bottoms that support riparian vegetation. Vegetated riparian buffers trap sediment, shade stream corridors, provide migratory corridors for wildlife, contribute woody debris and litter to streams, improve water quality by intercepting runoff from adjacent uplands, provide important habitat for terrestrial and avian species, and stabilize streambanks to prevent erosion.

RCAs are delineated along perennial and intermittent streams, and are determined either in the field, based on professional judgement of ecological function and process or, in the absence of field data, as follows (Forest Service 2003a):

- For forested streams (perennial), the RCA is defined as the land within a buffer of 300-feet slope distance from the ordinary high-water mark. This includes intermittent streams providing seasonal rearing and spawning habitat (Forest Service 2003a).
- For forested streams (intermittent), the RCA is defined as the land within a buffer of 150-feet slope distance from the ordinary high-water mark.
- For non-forested streams (perennial and intermittent), the RCA is defined as the land within a buffer equal to the extent of the flood prone width, or riparian vegetation, whichever is greatest.

Perennial and intermittent streams that support riparian and/or wetland vegetation along their streambanks occur throughout the analysis area. RCAs within the Mine Site and Off-site Focus Areas associated with perennial and intermittent streams mapped within the analysis area are presented in Table 3.11-2. The major drainages in the analysis area are described in Table 3.11-3. Note that since many riparian areas may also include delineated wetlands, there is overlap in the acreages of RCAs listed in Table 3.11-2 and wetlands listed in Table 3.11-3. General descriptions of riparian habitats taken from the primary drainages documented in available stream evaluations for the SGP (HDR 2016b; Rio Applied Science and Engineering 2019) are presented below. The most common riparian vegetation species that have been observed surrounding drainages in the analysis area include alder, willow, currant, and red-osier dogwood (*Cornus sericea*), with an understory of various forbs and grasses, particularly in open areas not otherwise dominated by shrubs (Forest Service 1994; HDR 2013). Portions of streams in the mine site focus area, and their associated riparian areas, have been affected by legacy mining-related activities (Forest Service 1994).

### Table 3.11-2 Streams and RCAs in the Analysis Area

<table>
<thead>
<tr>
<th>Analysis Area Component</th>
<th>Perennial (feet)⁴</th>
<th>Non-Perennial (feet)⁴</th>
<th>RCA (acres)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site Focus Area</td>
<td>208,302</td>
<td>110,224</td>
<td>2,655</td>
</tr>
<tr>
<td>Off-Site Focus Area</td>
<td>189,549</td>
<td>76,899</td>
<td>127,389</td>
</tr>
</tbody>
</table>

⁴ Stream lengths listed come from multiple baseline studies as summarized in Tetra Tech 2021d

² RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.
Table 3.11-3  Major Drainages in the Analysis Area

<table>
<thead>
<tr>
<th>Major Drainages</th>
<th>SGP Component</th>
<th>Threatened/Endangered Fish Species and/or Critical Habitat Present in any Part of the Stream¹</th>
<th>Stream Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadow Creek</td>
<td>Mine Site</td>
<td>Presence-BT, CS Critical Habitat-BT, CS</td>
<td>Meadow Creek is a major tributary to the East Fork SFSR that flows through a flat-bottomed valley surrounded by steep mountains. Elevations range from approximately 6,200 feet above sea level in the lower reach to over 7,500 feet in the headwaters. Meadow Creek has been heavily impacted by legacy mining-related activities, including deposition of tailings and spent heap leach ore, ore processing facilities, heap leach pads, and other infrastructure, stream relocation into a straightened riprap channel, and construction of an airstrip (Midas Gold 2016a). The downstream end of the valley shows remnant effects from early mining activities, along with a large outwash feature created by a dam failure in the EFMC drainage south of the site of the Meadow Creek Mine. Portions of the creek have been modified over the years to improve conditions caused by past mine operations, including the regrading and revegetation of the 2 percent gradient lower reach of the creek in 2004 and 2005. The middle reach of Meadow Creek is an engineered channel that was constructed to bypass the spent ore disposal area. The channel was lined with riprap over geotextile fabric and is confined between reinforced/engineered slopes with a gradient of less than 2 percent. This reach has a short section with a 9 percent gradient, shallow depths, and few pools, which may be a partial fish migration barrier at low flows. The channel includes low-gradient riffles, glides (section of the stream coming out of a pool) and runs. There is no side channel development or potential large woody debris recruitment. The upper reach of Meadow Creek encompasses the headwaters downstream to the location of the proposed TSF Buttress. Upper Meadow Creek is confined and high gradient at the most upstream extent and low gradient and unconfined immediately upstream of the spent ore disposal area in lower Meadow Creek, transitioning from a gradient of 4 to 8 percent to 2 to 4 percent. Habitat is composed of riffles, step runs (sequence of runs separated by shorter riffle steps), and pools. The presence of side channels in some portions provide potential for lateral channel movement in the less confined sections. Immediately upstream of the spent ore disposal area, Meadow Creek is unconfined, with a gradient less than 1 percent. The reach is composed of low-gradient riffle, step run, and pool habitat. The floodplain is active with oxbow cutoffs, side channels, and backwater features.</td>
</tr>
<tr>
<td>Major Drainages</td>
<td>SGP Component</td>
<td>Threatened/Endangered Fish Species and/or Critical Habitat Present in any Part of the Stream¹</td>
<td>Stream Description</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>East Fork SFSR</td>
<td>Mine Site, McCall-Stibnite Road (CR 50-412) (temporary access), Utilities</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>This perennial headwater stream flows through most of the analysis area. The ordinary high-water mark (OHWM) is 2 to 3 feet deep by 25 to 30 feet wide. A human-made, open-water pond (approximately 4.5 acres) is located in the Yellow Pine pit. The steep cascade of the East Fork SFSR spilling into the pond cuts off fish passage. The stream has relatively abundant riparian vegetation, except in the vicinity of the Yellow Pine pit. Per the Payette Forest Plan, riparian vegetation in the Big Creek/Stibnite Management Area is at or near properly functioning condition, except for localized areas affected by mining, roads, and recreation.</td>
</tr>
<tr>
<td>Fiddle Creek</td>
<td>Mine Site, Access Roads</td>
<td>Presence-None known</td>
<td>Fiddle Creek is a small tributary of the East Fork SFSR just upstream of Midnight Creek. Habitat conditions in the creek have been impacted as a result of legacy mine operations, road construction, and culvert installation (Midas Gold 2016a). Fiddle Creek also was the site of a former water storage reservoir in the lower watershed, the construction and operation of which degraded portions of the stream. The lower reach of Fiddle Creek has an approximate 37 percent gradient where it flows into the East Fork SFSR, creating a complete barrier to upstream fish passage (HDR 2016b). Upstream of this barrier, Fiddle Creek retains a relatively high gradient in a relatively narrow channel, with side channels (HDR 2016b). The creek has a thick tall-shrub overstory dominated in its lower portion by gray alder (<em>Alnus incana</em>). The uppermost section of Fiddle Creek flattens in gradient, becoming a slower meandering stream due to natural glacial topography. Large amounts of large woody debris occur throughout the creek, and the dominant streambed substrate consists of boulders, large cobble, and gravel (HDR 2016b).</td>
</tr>
<tr>
<td>EFMC (&quot;Blowout Creek&quot;)</td>
<td>Mine Site</td>
<td>Presence-CS</td>
<td>The EFMC, also known as “Blowout Creek,” is a tributary to Meadow Creek that has been severely impacted as a result of legacy mining-related activities and the failure of a dam constructed across its stream channel (Midas Gold 2016a). The dam was constructed in 1929 to supply hydroelectric power for historical milling operations. The dam failed in 1965 due to record snow melt and runoff rates, depositing large volumes of sediment into Meadow Creek, the East Fork SFSR, and the Yellow Pine pit lake (MWH 2017). This stream is considered to be the largest source of sediment to the East Fork SFSR in the analysis area. The middle reach of EFMC flows through a lateral glacial moraine that eroded during the dam failure and is still considered unstable as it continues to deposit sediments into Meadow Creek and the East Fork SFSR. Upstream of this middle reach, East Fork Meadow Creek has a low-gradient pool-riffle reach flowing through a large meadow. This reach is incised and continues to headcut in response to</td>
</tr>
</tbody>
</table>

¹: Stream1
## Major Drainages

<table>
<thead>
<tr>
<th>Major Drainages</th>
<th>SGP Component</th>
<th>Threatened/ Endangered Fish Species and/or Critical Habitat Present in any Part of the Stream¹</th>
<th>Stream Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garnet Creek</td>
<td>Mine Site</td>
<td>Presence-None known</td>
<td>Garnet Creek is a narrow, shallow, moderate-gradient tributary to East Fork SFSR approximately 0.3 mile downstream from the Meadow Creek confluence. The creek has been severely modified over the past 100 years to accommodate mining-related activities. It is still influenced by legacy mining infrastructure that was located across and adjacent to the stream channel, including portions of a town site; and is currently routed through several man-made ditches (Midas Gold 2016a). Garnet Creek flows through an 85-foot-long corrugated metal pipe culvert near its confluence with the East Fork SFSR that presents a partial barrier to fish (HDR 2016b).</td>
</tr>
<tr>
<td>Midnight Creek</td>
<td>Mine Site</td>
<td>Presence-None known</td>
<td>Midnight Creek is a small tributary of the East Fork SFSR. The lower portion of the creek has as a narrow channel with extremely high gradient (approximately 90 %) and dense overhanging vegetation. The high gradient presents a complete fish passage barrier to fish (HDR 2016b). Midnight Creek has been impacted by legacy mining activities, including open-pit mining, waste rock dumps, and road construction (Midas Gold 2016a).</td>
</tr>
<tr>
<td>Unnamed Tributary (&quot;Hennessy Creek&quot;)</td>
<td>Mine Site, Access Roads</td>
<td>Presence-None known</td>
<td>Hennessy Creek historically flowed into the East Fork SFSR downstream of the Yellow Pine pit lake, but it has been diverted to flow into the East Fork SFSR downstream of Sugar Creek. It is a narrow, low-flow stream that flows in a constructed ditch alongside McCall-Stibnite Road (CR 50-412), and then through a subterranean section under an adjacent waste rock dump before passing through a very high-gradient reach into the East Fork SFSR. The creek is not expected to support upstream fish passage because of an average channel gradient of 37 percent at its mouth (HDR 2016b). Hennessy Creek is densely vegetated and shallow. The lower portion of Hennessy Creek has been significantly impacted by legacy mine-related activities, including stream diversion, road construction that buried the stream channel, and mining infrastructure (Midas Gold 2016a).</td>
</tr>
</tbody>
</table>

¹ The dam failure. There are few trees, and the banks have abundant grasses. The dominant streambed material is sand and gravel (MWH 2017). The EFMC headwaters are high gradient (4 to 20%) with cascades, high-gradient riffle, and plunge-pool habitat.

Immediately downstream of the historical dam location, the creek has a slightly steeper (8 to 20%) gradient and is composed of cascade habitat. Near the confluence with Meadow Creek, the EFMC passes through a multi-thread and unconfined alluvial fan with a 4 to 8 percent gradient. Sediment from the unstable slopes immediately upstream may contribute to the formation and maintenance of this alluvial fan.
<table>
<thead>
<tr>
<th>Major Drainages</th>
<th>SGP Component</th>
<th>Threatened/Endangered Fish Species and/or Critical Habitat Present in any Part of the Stream&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Stream Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit Creek</td>
<td>Mine Site</td>
<td>Presence-None known</td>
<td>This is a perennial tributary to the East Fork SFSR. The OHWM is 1 to 2 feet deep by 1 to 3 feet wide.</td>
</tr>
<tr>
<td>West End Creek</td>
<td>Mine Site, Access Roads</td>
<td>Presence-None known</td>
<td>This is a tributary to Sugar Creek, large portions of which are non-perennial. The OHWM is 1 to 2 feet deep by 1 to 3 feet wide. This creek has been disturbed by mining-related activities, including rock deposition into the channel, diversion into a French drain, and in-channel mining. Upstream, the banks are well vegetated and steep with a Douglas-fir overstory.</td>
</tr>
<tr>
<td>Sugar Creek</td>
<td>Mine Site</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>Sugar Creek, a tributary to the East Fork SFSR, enters the river downstream of the Yellow Pine pit lake. It has a relatively low gradient. An officially closed road closely parallels Sugar Creek for nearly 2 miles before crossing the creek. This road may confine the movement of Sugar Creek, specifically in areas where the banks are bound with riprap rock material. Much of Sugar Creek has large aggregates of large woody debris. The dominant substrates are sand, gravel, and cobble. The creek has widened channels and excessive medial and lateral bar formation in response to past sediment inputs. In the 1940s, approximately 1 million cubic yards of glacial overburden was removed from the East Fork SFSR channel and placed in both Sugar Creek and other parts of the East Fork SFSR (Kuzis 1997).</td>
</tr>
<tr>
<td>Burntlog Creek</td>
<td>Access Roads</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>This is a perennial tributary to Johnson Creek. The OHWM of crossings ranges from 2 to 3 feet deep and 25 feet wide to many small tributaries that are 0.5 feet deep and less than 3 feet wide. Burntlog Creek is a moderate-gradient stream that occupies a steep valley floor in its upper reaches and parallels Johnson Creek at its base. Woody debris is common in the upper reaches due to extensive burns in this area. Overhead canopy is minimal.</td>
</tr>
<tr>
<td>Johnson Creek</td>
<td>Access Roads; Existing Transmission Line</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>This is a perennial tributary to the East Fork SFSR. The OHWM is 30 to 50 feet wide and up to 4 feet deep.</td>
</tr>
<tr>
<td>Major Drainages</td>
<td>SGP Component</td>
<td>Threatened/Endangered Fish Species and/or Critical Habitat Present in any Part of the Stream(^1)</td>
<td>Stream Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Riordan Creek</td>
<td>Access Roads; New Transmission Line</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>This is a tributary to Johnson Creek. Riordan Lake, which was formed as a result of a large glacial landslide that dammed the creek, is located halfway down the creek. Upstream reaches of Riordan Creek are low-gradient and downstream reaches are high-gradient.</td>
</tr>
<tr>
<td>Trapper Creek</td>
<td>Access Roads; Existing Transmission Line</td>
<td>Presence-BT, SH, CS Critical Habitat-BT, SH, CS</td>
<td>This is a moderate gradient tributary to Johnson Creek.</td>
</tr>
</tbody>
</table>


\(^1\) Species presence was reported in MWH 2017. For more details refer to Section 3.12.

CR = County Road, BT = Bull trout, CS = Chinook salmon, SH = Steelhead/Redband/Rainbow trout.
3.11.4.5 Wetlands Functions and Values

This section summarizes the wetland functional assessments that have been conducted in the analysis area (watershed condition indicators, which include stream function, are documented in Section 3.12 and in the Fish Resources and Fish Habitat Specialist Report [Forest Service 2022i]). Wetland functions are self-sustaining properties of a wetland ecosystem that exist in the absence of societal values and relate to ecological significance without regard to subjective human values. Flood attenuation and provision of off-channel fish habitat are examples of wetland functions. Wetland values are those elements of a wetland that are valued by humans, such as flood hazard reduction or recreational/hunting uses (Berglund and McEldowney 2008). Wetland functions and values were assessed to evaluate the condition of existing wetland resources so that the potential impacts of activities associated with the SGP can be understood and disclosed.

The MWAM ranks wetland functions in four categories: I through IV, with Category I having the highest functional value. Descriptions of relevant categories are as follows (Berglund and McEldowney 2008):

- **Category I** wetlands are of exceptionally high quality and generally are rare to uncommon in the state or are important from a regulatory standpoint. They can provide primary habitat for sensitive species, represent a high-quality example of a rare wetland type, provide irreplaceable ecological functions, and/or exhibit high flood attenuation capability, or are assigned high ratings for most assessed values and functions.
- **Category II** wetlands are those that provide habitat for sensitive plants or wildlife, function at very high levels for wildlife/fish habitat, are unique in a given region, or are assigned high ratings for many of the assessed functions and values but are more common than Category I wetlands.
- **Category III** wetlands are common and generally are less diverse than Category I and II wetlands. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands.
- **Category IV** wetlands generally are small, isolated, and lack vegetative diversity. These sites provide little in the way of wildlife habitat and often are indirectly disturbed.

Per the assessments conducted by HDR and Tetra Tech, 1 of the 21 evaluated wetland AAs rated as Category IV, 17 rated as Category III, and 3 rated as Category II (Tetra Tech 2021c, Forest Service 2022h; **Figure 3.11-2**).

Depending on the specific wetland being evaluated, up to 11 functions/values can be evaluated for each assessment area (AA) using MWAM (Berglund and McEldowney 2008) including:

- **Habitat for federally listed or proposed threatened or endangered plants or animals**: Whether or not an AA is known to or suspected to function as habitat for species receiving protection under provisions of the ESA.
- **General wildlife habitat**: The general potential to provide wildlife habitat based on evidence of wildlife use and existence of generally desirable habitat features.
- **General fish habitat**: The general fish habitat quality. This function is assessed only if the AA is used by fish or if the existing situation is correctable such that the AA could be used by fish (e.g., fish use is blocked by inaccessible culvert or another barrier).
- **Flood attenuation:** The capability of wetlands in the AA to slow and disperse the potentially hazardous flow energy during high-water or flood events. This parameter only applies to AAs that occur within or contain a discernable floodplain.
- **Long- and short-term surface water storage:** The potential of the AA to capture, retain, and make available surface water originating from flooding, precipitation, upland surface (sheetflow) or subsurface (groundwater) flow.
- **Sediment/nutrient/toxicant retention and/or removal:** The ability of the AA to retain sediments and retain and remove excess nutrients and toxicants. This function is sometimes referred to as “water quality improvement.” This parameter only applies to wetlands with potential to receive sediments and excess nutrients or toxicants through influx of surface water, groundwater, or direct input.
- **Sediment/shoreline stabilization:** The ability of an AA to dissipate flow or wave energy, reducing erosion. This function is only assessed if a wetland within an AA occurs on the banks for a river, stream, or other natural or manmade channel, or occurs on the shoreline of a standing water body that is subject to wave action.
- **Production export/terrestrial and aquatic food chain support:** The potential of an AA to produce and export food and/or nutrients for both terrestrial and aquatic organisms.
- **Groundwater discharge/recharge:** The potential for groundwater discharge and recharge at the AA.
- **Uniqueness:** The general uniqueness of an AA in terms of its replacement potential and habitat diversity, relative abundance in the same major watershed basin, and degree of human disturbance.
- **Recreation/education potential:** The general potential of an AA to support recreation or education activities.

Assessed wetlands at the mine site generally exhibit moderate to high levels of disturbance from historic mining activity, erosion, and fire. They do not support known populations of ESA-listed threatened or endangered plant species (HDR 2013, 2014a, 2014b; Tetra Tech 2018); however, potential habitat and occurrences of Forest Service Sensitive and Forest Watch plant species do occur in wetlands near the SGP (Section 3.10). In addition, metal concentrations in some wetlands at the mine site exhibit the influence of the historical mining activity primarily through elevated arsenic and antimony concentrations (HDR 2017f).

Many of these wetlands were noted during surveys as having the potential to provide habitat for a variety of wildlife species managed by the Forest Service because of their sensitivity, including northern leopard frogs, fishers, boreal owls, western toads, black-backed woodpeckers, northern goshawks, and wolverines (Tetra Tech 2018). Wetlands rated as Category II generally received high scores due to the provision of habitat associated with sensitive species with potential to occur in the area (Section 3.13).

Wetlands on slopes, generally resulting from groundwater seepage, function to deliver water, sediment, and nutrients to valley bottom wetlands below. These typically exhibit less water filtration or flood storage functions because water moves through these wetlands without being detained. However, they often provide valuable habitat for terrestrial species, and they can contribute cool water to wetlands and streams in the valley bottoms.
Figure 3.11-2
Wetland Analysis
Mine Site Map
Stibnite Gold Project
Stibnite, ID

LEGEND

- Watershed Boundary
  (USGS HUC* 10)
- Wetlands
- Functional AAs
  AA-10
  AA-12
  AA-15
  AA-16
  AA-19
  AA-20
  AA-21

Project Components

- SGP Features**
- Utilities
- --- New Transmission Line
- Other Features
  - U.S. Forest Service
  - City/Town
  - Monumental Summit
  - County
  - Railroad
  - Highway
  - Road
  - Stream/River
  - Lake/Reservoir

*US Geological Survey Hydrologic Unit Code
**Project Components are associated with both Alternatives.

Note:
East Fork Meadow Creek is also known as Blowout Creek.
The McCall - Stibnite Road (CR 53-412) consists of Little Creek Road, East Fork South Fork Salmon River Road, and Stibnite Road.

1 inch = 0.84 miles when printed at 11x17

10 ft = 0.0008 miles when printed at 11x17

1706020801 Johnson Creek

1706020802 Upper East Fork South Fork Salmon River

1706020807 Indian Creek

Project Area

Other Data Sources: Midas Gold; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest

Base Layer: USGS Shaded Relief Service
Wetlands located along valley bottom drainages, both on and off the mine site, have the potential to provide water quality, flood storage, and fish habitat functions. These streamside wetlands filter flowing water during high flow events when water is most likely to contain fine sediments that can be harmful to fish. Given the history of mining activity and historical tailings deposits at the mine site, these water quality functions are an important aspect of stream health, both at, and downstream, of the mine site. During high flows, streamside wetlands also provide off-channel refuge for small fish that seek such areas when currents in the main channel become too strong for them.

A summary of the primary functions provided within each AA and the functional assessment scores for each AA can be found in Appendix A of the SGP Wetland and Riparian Areas Specialist Report (Forest Service 2022h).

3.12 Fish Resources and Fish Habitat

3.12.1 Introduction

This section describes the fish resources and fish habitats in the analysis area of the SGP under existing (baseline) physical, chemical, and environmental conditions. While all fish species are of management interest, four special status salmonids (i.e., fish in the family Salmonidae, which includes salmon, trout, and whitefish) are of particular resource management interest because of their status as federally listed fish or fish of management concern to the Forest Service or State of Idaho. Of the four fish species, three are federally listed as threatened species under the ESA: summer Chinook salmon, Snake River Basin steelhead, and Columbia River bull trout. Also, the Payette Forest Plan (Forest Service 2003a) has designated bull trout as a MIS. In addition, the Forest Service (Intermountain Regional Forester) has identified the westslope cutthroat trout as a Forest Service sensitive species.

3.12.2 Fisheries and Aquatic Habitat Resources Area of Analysis

The analysis area for fish and fish habitat includes the area where effects (direct/indirect) may be caused by the proposed activities (FSH 1909.15, 15.2a). The analysis area encompasses all areas in which fish resources and fish habitat may be affected directly or indirectly by the SGP, and not merely the immediate area involved. The analysis area is located in the SFSR hydrological subbasin and the North Fork Payette River hydrological subbasin (Figure 3.12-1). The analysis area for fish resources also includes all of the watercourses (i.e., streams and rivers) and waterbodies (i.e., lakes, reservoirs) in the 12-digit HUC subwatersheds that overlap the SGP area.

In the SGP analysis area the hydrologic units of relevance are, from largest to smallest:

- Salmon River “Basin” (HUC 170602) and Middle Snake-Boise “Basin” (HUC 170501);
- SFSR “Subbasin” (HUC 17060208) and North Fork Payette River “Subbasin” (HUC 17050123);
- Numerous “Watersheds” within each subbasin (i.e., Upper East Fork Salmon River Watershed (HUC 1706020804); and
- Numerous “Subwatersheds” within each watershed (i.e., Headwaters East Fork SFSR Subwatershed (HUC 170602080201). Subwatersheds are sometimes referenced as “6th field” or “HUC 12” due to the 12-digit numerical code assigned to each.
The physical footprint of the SGP where mining is proposed (i.e., the proposed “mine site” footprint) occurs within two subwatersheds: Sugar Creek and Headwaters East Fork South Fork Salmon River (Figure 3.12-2), labeled numbers 5 and 6 on Figure 3.12-1. Immediately downstream of these two subwatersheds is the adjacent No Mans Creek-East Fork South Fork Salmon River subwatershed that also is discussed in this section (HUC 170602080206), which is labeled number 4 on Figure 3.12-1. This latter subwatershed is within the analysis area, but not within the proposed mine site.

The analysis area for fish resources also includes all of the watercourses (i.e., streams and rivers) and waterbodies (i.e., lakes, reservoirs) in the 12-digit HUC subwatersheds that overlap the SGP area. Because the majority of the activities and disturbance would occur at the mine site, which is located in the SFSR subbasin, greater emphasis is placed on describing the affected environment within this subbasin. However, relevant habitat conditions in other subbasins, watersheds, and subwatersheds that may be impacted by SGP activities also are described, as appropriate.

The SGP affects watersheds within the analysis area differently depending on the activities proposed for each area. The majority of the mining activity occurs within the headwaters of the East Fork SFSR subwatershed (HUC 170602080201). In this subwatershed, surface water conditions are affected by ground disturbance, development of mine facilities, and water abstraction for mine dewatering, contact water management, and consumptive use (see Section 4.12.2.2). As a result, stream flows in the watershed would be reduced by up to 30 percent during operations. While project design features and regulatory requirements maintain water chemistry conditions, removal of riparian shading increases predicted stream temperatures by up to 6.6°C until a time that restoration efforts would effectively shade stream flows and reduce temperatures toward baseline conditions. When the tools utilized to evaluate fish habitat (e.g., intrinsic potential, occupancy, and flow productivity modeling) are applied to these to the forecasted flow and temperature conditions in the headwaters of the East Fork SFSR watershed, they indicate a change from existing conditions.

Under the SGP, there would be limited mining activity in the Sugar Creek watershed (HUC 170602080202) with most of the effects associated with diverting the West End Creek around the West End pit (see Section 4.12.2.2). West End Creek is not fish bearing and contributes relatively minor flow volumes to Sugar Creek. Predicted flow reductions in Sugar Creek attributable to the SGP would be typically less than 1 percent with a maximum monthly difference of 3 percent. Predicted stream temperature changes would be between 0.1 and 0.3°C, with maximum summer temperatures ranging from 15.5°C to 15.7°C compared to a baseline temperature condition of 15.4°C. Application of fish habitat evaluation tools to these conditions in Sugar Creek would not indicate an observable change from existing conditions. For the other watersheds in the analysis area, SGP-related effects are associated with site access and transportation which are not expected to affect streamflow and temperature conditions to the degree that fish habitat evaluation tools would indicate change from existing conditions.

Because of the minimal SGP effects anticipated to Sugar Creek, the focus of the environmental consequences analyses (Section 4.12) is on the headwaters of the East Fork SFSR.
Subwatersheds
1 - Quartz Creek
2 - Profile Creek
3 - Tamarack Creek
4 - No Mans Creek-East Fork South Fork Salmon River
5 - Sugar Creek
6 - Headwaters East Fork South Fork Salmon River
7 - Porcupine Creek-Johnson Creek
8 - Riordan Creek
9 - Trapper Creek-Johnson Creek
10 - Ditch Creek-Johnson Creek
11 - Burntlog Creek
12 - Sheep Creek-Johnson Creek
13 - Headwaters Johnson Creek
14 - Lunch Creek-Johnson Creek
15 - Warm Lake Creek
16 - Six-bit Creek-South Fork Salmon River
17 - Curtis Creek
18 - Upper Big Creek
19 - Lower Big Creek
20 - Pearso Creek-North Fork Payette River
21 - Beaver Creek
22 - Duck Creek-Cascade Reservoir
23 - Lower Gold Fork River
24 - Boulder Creek
25 - Lake Fork

LEGEND
- Analysis Area
- Subwatershed (see table)

Watershed
- Cascade Reservoir
- Johnson Creek
- Lower East Fork South
- Fork Salmon River
- Upper East Fork South
- Fork Salmon River
- Upper South Fork
- Salmon River

Project Components *
- SGP Features
- Utilities
- Existing Communication Tower
- Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

Surface Management Agency
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- State Fish and Game
- State Parks and Recreation
- U.S. Forest Service

* Project Components are associated with 2021 MMP.

Note: The McCall – Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.
Figure 3.12-2
Mine Site Subwatersheds
Stibnite Gold Project
Stibnite, ID

Legend
- Subwatershed (HUC 12)
  Headwaters East Fork South Fork Salmon River Drainages
  Sugar Creek Drainages

Other Features
- U.S. Forest Service
- Wilderness
- County
- Stream/River
- Lake/Reservoir

Surface Management
- Private
- U.S. Forest Service

Frank Church-River of No Return Wilderness
Boise National Forest
Payette National Forest
Salmon-Challis National Forest

Base Layer: ESRI World Terrain Basemap
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Ecosystem Sciences; Boise National Forest; Payette National Forest
3.12.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to Fisheries and Aquatic Resources. Additional descriptions of these regulations can be found in the SGP Fisheries and Aquatic Resources Specialist Report (Forest Service 2021).

Land and Resource Management Plan: The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired conditions for wildlife and wildlife habitat and include various objectives, guidelines, and standards for this purpose.

Portions of the BNF are administratively managed by the PNF due to location. Forest Service regulations and the Forest Plans (Forest Service 2003a, 2010a) provide guidance on resource management on NFS lands. The SGP is located in PNF Management Area 13 (Big Creek/Stibnite) and in BNF Management Areas 17 (North Fork Payette River), 19 (Warm Lake), 20 (Upper Johnson Creek), and 21 (Lower Johnson Creek), which are described in the respective Forest Plans. In addition, Appendix B of both the Payette and Boise Forest Plans provides NEPA guidance with respect to evaluating the ecological functionality of aquatic resources in the analysis area using Watershed Condition Indicators (WCI) under existing baseline conditions because they may be affected by the SGP.

U.S. Army Corps of Engineers 404 Permit: Under Section 404 of the CWA (33 United States Code [USC] 1344), a DA, USACE permit is required for the discharge of dredged and/or fill material into WOTUS. This would include discharges of dredge and/or fill material associated with activities, such as the construction of road crossings, water diversions, waste rock disposal in a stream, and other facilities associated with the SGP’s construction, operation, and closure and reclamation.

Endangered Species Act Section 7 Consultation: The ESA (16 USC 35 1531 et seq. 1988) provides for the protection and conservation of threatened and endangered species and their Critical Habitats. Section 7 of the ESA (16 USC 1531 et seq.) requires all federal agencies to consult with the USFWS and/or the NMFS or NOAA Fisheries, collectively known as “the Services”, which share regulatory authority for implementing the ESA. Federal agencies must submit a consultation package for proposed actions that may affect ESA-listed species, species proposed for listing, or designated Critical Habitat for such species. The USFWS generally manages ESA-listed terrestrial and freshwater plant and animal species, while NOAA Fisheries is responsible for marine species, including anadromous fish.

“Critical habitat” is defined by the ESA as specific areas within the geographical area occupied by listed species at the time of listing that contains the physical or biological features essential to conservation of the species and that may require special management considerations or protection (50 CFR 424). Critical habitat also may include specific areas outside the geographical area occupied by the species if the agency determines that the outside area itself is essential for conservation of the species.

The first step in the consultation process is an “informal” consultation with one or both of the Services to initially determine if the proposed action is likely to affect any listed species, species proposed for listing, or designated Critical Habitat in the analysis area. The federal agency taking the action or the “action
agency” (i.e., the Forest Service and the USACE in the case of the SGP) may prepare a BA (or designee, a non-federal representative to prepare the BA acceptable to the agency under federal regulation) to aid in determining a project’s effects on listed or proposed species or designated Critical Habitat. If the action agency determines that the action is likely to adversely affect ESA-listed or proposed species or designated Critical Habitat, then the action agency enters into “formal” consultation (or “conference” for species proposed for listing). The USFWS and/or NOAA Fisheries then prepare(s) a Biological Opinion and determines whether the action is likely to jeopardize the continued existence of the species or adversely modify designated Critical Habitat. If there is any anticipated “incidental take” (50 CFR 402.02 [defining “take”]) of a species, one or both of the Services must issue an Incidental Take Statement that includes terms and conditions and reasonable and prudent measures that must be followed to eliminate or minimize impacts to the species or its designated Critical Habitat.

**Sustainable Fisheries Act (Essential Fish Habitat):** In response to growing concern about the status of fisheries in the U.S., Congress passed the Sustainable Fisheries Act of 1996 (P.L. 104 297) to amend the Magnuson-Stevens Fishery Conservation and Management Act (P.L. 94-265), the primary law governing marine fisheries management in the federal WOTUS. NOAA Fisheries is responsible for protecting habitats important to federally managed marine species, which include anadromous Pacific salmon that occur in the SGP analysis area. Federal agencies must consult with NOAA Fisheries concerning any action that may adversely affect “Essential Fish Habitat” (EFH) pursuant to the amended Magnuson-Stevens Fishery Conservation and Management Act and its regulations (50 CFR 600). The Act defines EFH as habitats necessary to a species for spawning, breeding, feeding, or growth to maturity, which includes marine and riverine migratory corridors, spawning grounds, and rearing areas of Pacific salmon species. Given the SGP’s geographic location, Chinook salmon (Oncorhynchus tshawytscha) is the only species that has designated EFH within the SGP analysis area. As defined by the regulations, EFH includes “all streams, estuaries, marine waters, and other waterbodies occupied or historically accessible to Chinook salmon in Washington, Oregon, Idaho, and California” (50 CFR 660.412(a)). EFH is coincident with designated critical habit for Chinook salmon within the analysis area.

**Fish and Wildlife Coordination Act:** The Fish and Wildlife Coordination Act generally requires that federal agencies consult with the USFWS, the NMFS, and State wildlife agencies for activities that control or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat. This consultation is generally incorporated into the process of complying with NEPA, Section 404 of the CWA, or other federal permit, license, or review requirements. The Fish and Wildlife Coordination Act provides that wildlife conservation shall receive equal consideration and be coordinated with other features of a project.

The term “wildlife resources” is explicitly defined to include “birds, fishes, mammals, and all other classes of wild animals and types of aquatic and land vegetation upon which wildlife is dependent” (16 USC 666 (b)). Further, the Fish and Wildlife Coordination Act states that reports determining the possible damage to wildlife resources and an estimation of wildlife loss shall be made an integral part of any report prepared or submitted by the action agency with permitting authority (16 USC 662 (b), (f)).
Idaho Department of Water Resources – Stream Channel Protection Program: The Idaho Stream Channel Protection Act (Idaho Code Title 42, Chapter 38) requires that the stream channels of the state and their environments be protected against alteration for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, and water quality. The Idaho Stream Channel Protection Act applies to any type of alteration work done inside the ordinary high-water mark of a continuously flowing stream and requires a stream channel alteration permit from IDWR before commencing any work that would alter the stream channel. This means that the IDWR must approve, in advance, any work that is conducted within the beds and banks of continuously flowing streams (i.e., perennial streams). Stream channel alteration permitting requires a joint-permit application process with IDWR, the IDL, and the USACE.

Idaho Department of Fish and Game – Scientific Collection Permit and Fish Transport Permit: The IDFG requires a Scientific Collection Permit for any handling of fish that is not related to sportfishing with a state fishing license. The salvage and transport of fish by vehicle between capture and release sites for the proposed SGP is expected to require a fish transport permit.

3.12.4 Affected Environment

The following subsections describe the existing conditions of fish species, particularly Chinook salmon, steelhead, bull trout, and westslope cutthroat trout, and their habitat, as well as an overview of fish densities and watershed condition indicators (WCIs). Modeling tools are utilized to characterize fish habitat based on application of threshold criteria to available data for the site or other Idaho streams. In general, modeling tools are limited by the assumptions and data they employ and may not match field observations precisely. However, the modeling tools are utilized to form a basis for consistent comparisons between habitat criteria, existing conditions, and forecasts of future conditions.

Perpetua funded aquatic resources baseline studies from 2012 to 2020 specifically for the SGP within the mine site area and along the Burntlog Route area (AECOM 2020a). Fish data was collected through snorkel surveys, electrofishing, videography, and environmental Deoxyribonucleic Acid (eDNA) sampling (MWH 2017; Stantec 2018, 2019). Figures 3.12-3a and 3.12-3b show the location of these surveys. In 2015, fish tissue was collected to check for metal concentrations and DNA analysis.

Field investigations to characterize existing aquatic physical habitat in the mine site area and along the Burntlog Route area were performed between 2012 and 2020 (Great Ecology 2018; HDR 2016c; Rio ASE 2019a, 2020b; MWH 2017; Stantec 2018, 2019, 2020; Watershed Solutions Inc. 2021) (Figure 3.12-4). These investigations collected information on aquatic habitat parameters, such as water temperature, substrate size, substrate embeddedness, surface fines, channel geometry and physical attributes, large woody debris, and pool frequency. Stream habitat condition surveys, following the PACFISH/INFISH Biological Opinion (PIBO) protocols, collected information on bankfull width, wetted width, bank stability, sediment size, stream gradient, pool dimensions, and large woody debris.
3.12.4.1 Fish Species

The four federally listed or Forest Service sensitive fish species (i.e., special status fish species) known to be present in the analysis area are Chinook salmon, steelhead trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), and westslope cutthroat trout (*Oncorhynchus clarkia lewisi*). Chinook salmon, steelhead, and bull trout are all federally listed as threatened under the ESA, and westslope cutthroat trout is a Forest Service sensitive species. Bull trout is also a Forest Service MIS on the PNF and the BNF and are among the most sensitive to changes in environmental variables, such as water temperature, sediment, or contaminants.

Other native fish species found within the analysis area include mottled sculpin (*Cottus bairdii*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), mountain whitefish (*Prosopium williamsoni*), Pacific lamprey (*Entosphenus tridentatus*), and mountain sucker (*Catostomus platyrhynchus*). A list of every fish species documented in the analysis area, including non-native fish introduced to the area is provided in AECOM 2020f.

**Chinook Salmon**

Status

The Snake River spring/summer-run Chinook Salmon Evolutionary Significant Unit was listed as threatened under the ESA in 1992 (57 Federal Register 14653). Most Chinook salmon in the analysis area are considered “summer-run” fish (NMFS 2017). These fish are found throughout the analysis area, including naturally in the SFSR subbasin and the East Fork SFSR drainage upstream to the Yellow Pine pit lake within the mine site and upstream of the Yellow Pine pit when transplanted as discussed below.

A cascade with a current slope of 22 percent, caused by legacy mining activities, located upstream of Yellow Pine pit lake is a barrier to further upstream natural migration for adult Chinook salmon. Juvenile fish, however, can move downstream through the cascade because adult Chinook salmon have been reintroduced upstream of the Yellow Pine pit lake by the IDFG. Spawning-ready adult Chinook salmon are periodically translocated from the SFSR to upstream of the barrier with support from the Nez Perce Tribe.

Historically, the Snake River was considered the Columbia River Basin’s most productive drainage for salmon, supporting more than 40 percent of all Columbia River spring/summer Chinook salmon (Fulton 1968; NMFS 1995 in NMFS 2017). Currently, the stock has been severely depleted from a variety of activities, including hydropower systems, hatcheries, harvest, fish passage, and pathogens/predation/competition. Chinook salmon remain at risk of becoming endangered within 100 years (NMFS 2017).

The proposed status for the East Fork SFSR population is considered “maintained,” indicating there is a moderate (25 percent or less) risk of extinction over 100 years (NMFS 2017).
Figure 3.12-3a Aquatic Baseline Fish Survey Locations at the Mine Site Stibnite Gold Project Stibnite, ID

LEGEND
- Fish Survey Site
- SGP Features
- Operations Area Boundary
- Utilities
  - Existing Communication Tower
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - Monumental Summit
  - Railroad
  - Highway
  - Access Road
  - Stream/River Lake/
  - Reservoir
- Surface Management
  - Private
  - U.S. Forest Service


Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest, MWH and Stantec

1 inch = 0.6 miles when printed at 11x17

Yellow Pine Pit Lake

Yellow Pine Pit Lake

East Fork Salmon River

East Fork Salmon River

Yellow Pine Pit Lake

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River

East Fork Salmon River
Figure 3.12-3b
Aquatic Baseline
Fish Survey Locations
Along Burntlog Route
Stibnite Gold Project
Stibnite, ID

LEGEND
- Fish Survey Sites
- Analysis Area
- Project Components *
- SGP Features
- Burntlog Route
- Utilities
- Existing Communication Tower
- Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- Highway
- Road
- Lake/Reservoir

Surface Management
- Private
- U.S. Forest Service


Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest

1 inch = 2.25 miles when printed at 11x17
Figure 3.12-4
Aquatic Habitat Survey Locations
Stibnite Gold Project
Stibnite, ID


Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest, MWH, Stantec, and RIO.

LEGEND
Aquatic Habitat Survey Sites
- PBD Survey Location
- Channel Geometry / Attributes Survey Location
- LWD and Pool Frequency Survey Location

Project Components
- SGP Features
- Operations Area Boundary

Utilities
- Existing Communication Tower

Other Features
- U.S. Forest Service Wilderness
- County
- City/Town
- Monumental Summit Railroad
- Highway
- Road
- Non-fish-bearing Stream
- Stream/River
- Lake/Reservoir

Surface Management
- Private
- U.S. Forest Service

0 - 0.3
0 - 0.6
Miles
1 inch = 0.6 miles when printed at 11x17
Critical Habitat and Essential Fish Habitat

Critical habitat for Chinook salmon was originally designated in 1993 (58 Federal Register 68543) and re-designated in 1999 (64 Federal Register 57399). As defined, designated Critical Habitat includes all “river reaches presently or historically accessible (except reaches above impassible natural barriers (including Napias Creek Falls [Napias Creek tributary to the Salmon River]) and Dworshak and Hells Canyon Dams)” (64 Federal Register 57403). Thus, designated Critical Habitat includes all presently and historically accessible rivers and streams within the analysis area, except for the Payette River drainage.

Given the very broad definition of Critical Habitat for Chinook salmon, a more refined description of the affected environment for the SGP was needed. Two different sets of information were used to address this need. First, data on the distribution of Chinook salmon occurrences (fish observations and spawning redd counts) were compiled for 1985 to 2011 to determine the actual locations occupied by Chinook salmon (Isaak et al. 2017). The occurrence data was coupled with National Hydrography Dataset (NHD) flowlines (Horizon Systems 2019 [NHDPlus]). The premise was that NHD flowlines with species presence demonstrated empirical evidence of Chinook salmon Critical Habitat.

Second, available GIS data was used to model what likely is Critical Habitat for Chinook salmon within the mine site area upstream from the Yellow Pine pit (Ecosystem Science, LLC [ESS] 2019e). This approach identified a 12 percent maximum gradient (percent slope) within occupied NHD lines (Isaak et al. 2017), meaning Chinook salmon can migrate upstream through stream reaches that have a less than 12 percent gradient. Within the SGP mine site, stream segments below the gradient cut-off point were modeled as Critical Habitat (i.e., areas with steeper slopes were not identified as modeled Critical Habitat) (ESS 2019e). Currently, there is an estimated 26.5 km of modeled Chinook salmon Critical Habitat upstream of the Yellow Pine pit lake barrier (Figure 3.12-5).

The EFH characteristics important for anadromous salmon for freshwater spawning and rearing include water quality, water quantity, substrate, floodplain connectivity, forage, natural cover, and reaches free of artificial obstructions for freshwater migration (NMFS 2017). EFH has been designated for Chinook salmon within all streams and other waterbodies occupied or historically accessible to Chinook salmon (67 Federal Register 2343, 2002).

Physical and Biological Features and Recovery Plan

NMFS (2017) designated the following sites and essential physical and biological features as primary constituent elements for anadromous salmon and steelhead in freshwater:

- Freshwater spawning (water quality, water quantity, and substrate);
- Freshwater rearing (water quantity and floodplain connectivity, water quality and forage, and natural cover);
- Freshwater migration (free of artificial obstruction, water quality and quantity, and natural cover).
These physical and biological features have been designated because of their potential to develop or improve and eventually provide the needed ecological functions to support species recovery (NMFS 2017). The 2017 NMFS Recovery Plan identified recovery strategies for Snake River spring/summer Chinook salmon for the Lower East Fork SFSR and Upper East Fork SFSR watersheds.

Temperature Requirements and Baseline Conditions

Chinook salmon have different temperature requirements or limitations for their various life stages. Exceeding thresholds could impact various life-stages and could cause fish to avoid areas or even mortality. The periodicity (i.e., recurring intervals) of each life stage and the accepted stream temperature threshold ranges for various temperature considerations for each species were compiled from regulatory standards and other relevant literature into ESS 2019a, a condensed version of which is presented in Table 3.12-1.

Table 3.12-1  Chinook Salmon Optimal Temperature Thresholds and Modeled Length of Stream within the Water Temperature Thresholds

<table>
<thead>
<tr>
<th>Life Stage / Season¹</th>
<th>Range of Optimal Temperature Thresholds (°C)</th>
<th>Total Stream Length Above YPP / Below YPP</th>
<th>Baseline Stream Length within Optimal Temperature Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Above YPP / Below YPP</td>
<td>Above YPP</td>
</tr>
<tr>
<td>Adult Migration/ May – September²</td>
<td>12-19</td>
<td>10.92 / 2.01</td>
<td>7.48</td>
</tr>
<tr>
<td>Adult Spawning/ July – September⁴</td>
<td>4-14</td>
<td>10.92 / 2.01</td>
<td>10.92</td>
</tr>
<tr>
<td>Incubation/Emergence/ July – April⁴</td>
<td>6-10</td>
<td>10.92 / 2.01</td>
<td>3.44</td>
</tr>
<tr>
<td>Juvenile Rearing/ Year-round²</td>
<td>10-20</td>
<td>17.51 / 2.01</td>
<td>17.51</td>
</tr>
</tbody>
</table>

Source: EPA 2003, Poole et al. 2001, IDAPA 58.01.02
¹ The months in the life stage are not applicable for comparison to the SPLNT model results
² Analysis based Summer Maximum (July) 7 Day Average of the Daily Maximum
³ Percent of stream length within the modeled potential Intrinsic Potential habitat
⁴ Analysis based on Fall Maximum (September) 7 Day Average of the Daily Maximum
⁵ Percent of stream length within the modeled Critical Habitat
% = percent; °C = degrees Celsius; km = kilometers; YPP = Yellow Pine pit
Using the QUAL2K predicted maximum MWMT values and stream segment lengths from the Stream and Pit Lake Network Temperature (SPLNT) Model Refined Modified Proposed Action (ModPRO2) report (Brown and Caldwell 2021i), the length of proposed mine site streams within these temperature thresholds was estimated (Table 3.12-1). The QUAL2K stream segments that contain the segments in which there was modeled Intrinsic Potential (IP) habitat (discussed below) were evaluated for thermally suitable habitat (based on MWMT) for all life stages except juvenile rearing. For juvenile rearing, the QUAL2K stream segments that contain segments in which there was modeled Critical Habitat. It is important to note that the IP model applied more refined spatial scale (i.e., shorter reaches) than were applied in the SPLNT model. Hence, the stream segments evaluated for temperature could have lengths that extended beyond the ends of the segments evaluated for IP. Therefore, the lengths of habitat are not identical, meaning the length of habitat meeting the temperature thresholds may be longer than the length of habitat with IP. Additionally, modeled Critical Habitat extends to a much larger area than IP because the criteria defining Critical Habitat is based on a 12 percent gradient cut-off, whereas IP criteria are based on channel conditions, gradient, and valley bottom conditions. It is assumed that juvenile Chinook salmon are able to access a larger range of habitat conditions than the other life stages, and therefore, less restrictive habitat conditions were applied in the analysis.

The East Fork SFSR from 0.89 km downstream from the confluence with Sugar Creek to around 3.4 km upstream from the confluence with Meadow Creek (total of 8.59 km), and around 4.35 km of Meadow Creek were evaluated for the temperature thresholds. The entire 12.93 km of potential habitat is within the temperature thresholds for adult spawning and juvenile rearing; however, only 9.49 km (73.4 percent) and 3.44 km (26.6 percent) is within the water temperature threshold for adult migration and incubation and emergence. Of these total lengths, 10.92 km of suitable conditions for spawning and rearing, and all of the suitable conditions for migration and incubation and emergence are upstream from the Yellow Pine pit lake cascade barrier.

It is important to note that the creeks do experience significant diurnal variations, and that for mobile life stages (i.e., adults and juveniles), if MWMTs are above the thresholds, fish present may avoid areas within streams if they are able, such as finding thermal refuges.

**Distribution**

Chinook salmon are distributed throughout the analysis area (Figure 3.12-5); however, this section focuses on the mine site area and the travel corridor on Johnson Creek Road and the Burntlog Route. The East Fork SFSR population was historically a large population, with spawning areas throughout the East Fork SFSR mainstem and Johnson Creek (NMFS 2017). Anadromous fish passage in the East Fork SFSR upstream from the Yellow Pine pit lake was blocked in 1938 when activities for mining diverted the East Fork SFSR in surface ditches and later into a bypass tunnel (constructed in 1943). The East Fork SFSR was routed back through the Yellow Pine pit after mining ceased, but the remaining 22 percent gradient cascade, just upstream of the Yellow Pine pit lake, prevents Chinook from traveling upstream. There is a supplementation program to spawning habitat in Meadow Creek above the Yellow Pine pit, discussed below.

Chinook salmon occurrence in the analysis area varies by life stage. Adult migration occurs between May and mid-September, with most reaching the upper East Fork SFSR watershed by late July and August.
Spawning occurs from mid-July to September, with peak spawning in August, particularly in the mine site, where spawning is not typically observed before mid-August. Egg incubation begins after spawning, and emergence of larval fish occurs between January and April. Juvenile rearing occurs year-round and juvenile outmigration to the ocean occurs between mid-March to November (ESS 2019a).

Habitat for Chinook salmon is measured using two different tools – Flow productivity to determine the effect of stream flow changes on Chinook salmon productivity and intrinsic potential (IP) modeling to determine the potential for streams to support spawning and early-rearing habitat.

**Surplus Supplementation**

The Nez Perce Tribe began the Johnson Creek Artificial Propagation Enhancement Project in 1998 in response to critically low numbers of returning adult Chinook salmon to Johnson Creek (Columbia River Inter-Tribal Fish Commission 2018). The program uses only natural-origin returns for broodstock, and currently has an annual target release level of 100,000 yearling smolts into Johnson Creek (NMFS 2016).

The Nez Perce Tribe and IDFG translocated adult Chinook salmon from the SFSR to Meadow Creek (upstream from the Yellow Pine pit), but not as part of the Johnson Creek Artificial Propagation Enhancement Project. This out-planting program has been highlighted in the IDFG Fisheries Management Plan (IDFG 2019a). Between 2008 and 2017 (excluding 2014), Chinook salmon spawners were released into Meadow Creek when there are surplus adults from the McCall Fish Hatchery South Fork Salmon River Chinook Salmon Mitigation Program. It should be noted that any juvenile Chinook salmon upstream of the Yellow Pine pit lake cascade barrier were entirely human assisted; without fish translocation there are no naturally occurring Chinook salmon upstream of the Yellow Pine pit lake barrier.

**Redd Surveys**

A redd is a depression or hollow that a salmon creates in the stream substrate (i.e., bed) to deposit eggs. The Nez Perce Tribe has conducted redd surveys for Chinook salmon upstream of the Yellow Pine pit lake in the East Fork SFSR, Meadow Creek, and in other SFSR subbasin streams (e.g., Lower East Fork SFSR, Burntlog Creek, Johnson Creek, Sugar Creek, and Tamarack Creek) since 2008 (Nez Perce Tribe unpublished data 2018a; Rabe et al. 2018). Table 3.12-2 shows the number of redd counts between 2008 and 2018 in the East Fork SFSR and tributaries within or near the mine site and those that might be affected by the travel corridor on Johnson Creek Road and the Burntlog Route.
<table>
<thead>
<tr>
<th>Year</th>
<th>Meadow Creek - Proposed TSF to Confluence (6.3 km)</th>
<th>East Fork SFSR - Between Meadow Creek and Fiddle Creek (2.4 km)</th>
<th>East Fork SFSR - YPP Lake to Sugar Creek (1.1 km)</th>
<th>Sugar Creek - Cinnabar Creek to Confluence (4.3 km)</th>
<th>East Fork SFSR - Sugar Creek to Quartz Creek (15 km)</th>
<th>East Fork SFSR - Town of Yellow Pine to Confluence (0.8 km)</th>
<th>Johnson Creek - Upper Yellow Pine Creek to Confluence (45.5 km)</th>
<th>Burntlog Creek - East Fork Burntlog Creek to Confluence (8.5 km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>193</td>
<td>30</td>
</tr>
<tr>
<td>2009</td>
<td>41</td>
<td>10</td>
<td>10</td>
<td>40</td>
<td>46</td>
<td>2</td>
<td>235</td>
<td>16</td>
</tr>
<tr>
<td>2010</td>
<td>74</td>
<td>81</td>
<td>3</td>
<td>43</td>
<td>3</td>
<td>0</td>
<td>345</td>
<td>52</td>
</tr>
<tr>
<td>2011</td>
<td>89</td>
<td>131</td>
<td>0</td>
<td>10</td>
<td>73</td>
<td>3</td>
<td>194</td>
<td>41</td>
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<tr>
<td>2012</td>
<td>50</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>47</td>
<td>0</td>
<td>234</td>
<td>63</td>
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<tr>
<td>2013</td>
<td>40</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>46</td>
<td>0</td>
<td>201</td>
<td>34</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>17</td>
<td>42</td>
<td>2</td>
<td>376</td>
<td>41</td>
</tr>
<tr>
<td>2015</td>
<td>64</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>43</td>
<td>0</td>
<td>257</td>
<td>20</td>
</tr>
<tr>
<td>2016</td>
<td>128</td>
<td>7</td>
<td>18</td>
<td>13</td>
<td>55</td>
<td>0</td>
<td>253</td>
<td>28</td>
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<tr>
<td>2017</td>
<td>24</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2018</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>18</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2019</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>18</td>
<td>0</td>
<td>68</td>
<td>10</td>
</tr>
<tr>
<td>2020</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>107</td>
<td>6</td>
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<tr>
<td>2021</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>101</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Nez Perce Tribe unpublished data; Rabe et al 2018
East Fork SFSR = East Fork South Fork Salmon River; NA = Not Available; YPP = Yellow Pine pit
Redds observed upstream from the Yellow Pine pit cascade barrier are all from translocated Chinook salmon. During years when adults were translocated into Meadow Creek, redd counts varied from 24 (2017) to 128 (2016). In general, lower numbers of Chinook salmon redds were found in the East Fork SFSR, likely because Chinook salmon are translocated to Meadow Creek and tend to spawn in close proximity to their introduction sites and the fact that the fish are ready to spawn at the time of release. Chinook salmon redds documented in the East Fork SFSR (between the Yellow Pine pit lake and Meadow Creek) have ranged from 1 (2013) to 13 (2011), with an average of 5 redds per year over 11 years. The number of Chinook salmon translocated and the number of redds observed demonstrate a clear, positive relationship. As the number of adults translocated increased so did the number of redds.

Johnson Creek, a tributary of the East Fork SFSR downstream of the mine site, had the highest numbers of Chinook salmon redd counts in the Upper East Fork SFSR watershed, ranging from 193 (2008, 2011) to 376 (2014), with an average count of 207 redds per year.

Flow Productivity

The effects of flow changes on Chinook salmon productivity within the mine site area were analyzed using a flow-productivity model that was developed using the flow-productivity modeling approach for the Big Creek Water Diversion Project (NMFS 2013). Productivity (also referred to as adult or whole life cycle productivity) is estimated as the ratio of the number of returning adults to the total number of fish allowed to spawn naturally during the brood year (Morrow 2018). Therefore, productivity is a unitless measure or quantity of the number of returning adults. The SGP flow-productivity model regresses productivity against flow metrics using simple linear regression to output flow-productivity (ESS 2021).

The SGP flow-productivity model uses proxy data from nearby Johnson Creek and assumes that the physical and biological conditions in Johnson Creek are relatable to the mine site streams. However, there are many physical differences between upper East Fork SFSR and Johnson Creek, including drainage size, flow regime, and Chinook populations. Also, the SGP flow-productivity model assumes a fixed number of Chinook salmon spawners each year that occurred in Johnson Creek to occur across all of the mine sites (ESS 2021). Therefore, these flow-productivity estimates provide a rough approximation of changes in productivity due to flow within the mine site.

The flow productivity analysis predicts changes in productivity based solely on streamflow changes and it does not factor in additional habitat changes that would also occur in the analysis area (e.g., direct loss of habitat, water temperature changes, etc.). The model outputs help to show the relative effects of flow modifications on Chinook salmon productivity at the reach level. Chinook salmon productivity was assessed in four stream reaches (East Fork SFSR above Meadow Creek, East Fork SFSR at Stibnite, East Fork SFSR above Sugar Creek, and lower Meadow Creek). The lower Meadow Creek site (MC-6) was set up to supplement the system of USGS gages. MC-6 specifically examines conditions in the portion of Meadow Creek that is routed through a constructed channel to divert the stream away from historical mine waste.

The flow-productivity model outputs productivity values that are compared to baseline productivity values to calculate the predicted annual percent change in Chinook salmon productivity from baseline productivity. The baseline Chinook salmon productivity value of 1.06 was derived from productivity data.
collected on Johnson Creek (Morrow 2018). The interpretation of the predicted annual percent change in flow-productivity is based upon the baseline flow-productivity calculated with Johnson Creek data because data is not available within the mine site. Because the productivity value is greater than 1.0, if Johnson Creek were an unimpaired system, there would be slightly more returning adults than the spawning brood year.

**Intrinsic Potential**

To assist with describing the existing conditions and predicted potential changes in Chinook salmon habitat at the mine site, a site-specific IP model was developed to derive a predictive metric for streams in the mine site that could potentially support spawning and early-rearing habitat for the Chinook salmon. This model included geomorphic and hydrologic attributes, including mean annual discharge, channel gradient, and channel constraint, to estimate the latent potential of stream reaches to provide favorable habitat characteristics for spawning and early life stages. Additional details on the IP modeling effort can be found in the SGP Fish and Fish Habitat Specialist Report (Forest Service 2022i). In general, the IP is the underlying capacity (i.e., potential) of a stream to provide habitat. The IP model was used to estimate the potential for spawning and rearing habitat in the headwaters of the East Fork SFSR subwatershed *(Figure 3.12-6)*. This subwatershed encompasses the mine site where mining-related activities are proposed; which includes the East Fork SFSR and tributaries upstream from Yellow Pine pit, Meadow Creek and EFMC, East Fork SFSR and tributaries between Yellow Pine pit and Sugar Creek, and East Fork SFSR downstream from Sugar Creek. Flow reductions attributable to the project in Sugar Creek would typically be less than 1 percent with a maximum monthly difference of 3 percent. Flow differences of this magnitude would have little influence on the wetted width, bankfull width, gradient, valley bottom width, and valley width ratio parameters used to assess IP. However, Chinook salmon are known to occupy Sugar Creek under its existing IP condition which would not be measurably modified by the project.

The output from the IP model provides a classification that varies from “negligible” (minimal IP to support habitat) to “high” (likely to provide habitat) with low and medium classifications in between. See Intrinsic Potential Model Chinook Salmon and Steelhead Technical Memorandum (ESS 2019c) for a detailed description and discussion of the model and results. The IP model was used to evaluate over 51 km of stream habitat. Under baseline conditions, modeled IP stream length shows only 11.1 km of the 51 km have potential spawning and early-rearing habitat for Chinook salmon *(Table 3.12-3 and Figure 3.12-6)*. The majority of the IP habitat is rated as low potential, followed by medium and negligible, with high potential having the least amount available *(Table 3.12-3)*.
Table 3.12-3  Chinook Salmon Intrinsic Potential Modeling Results for Baseline Conditions

<table>
<thead>
<tr>
<th>Chinook Salmon IP¹</th>
<th>East Fork SFSR and Tributaries Upstream from YPP²</th>
<th>Meadow Creek and EFMC</th>
<th>East Fork SFSR and Tributaries between YPP and Sugar Creek</th>
<th>East Fork SFSR Downstream from Sugar Creek</th>
<th>Total IP Habitat in Mine Site Area (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length (km)</td>
<td>Percent Total Length</td>
<td>Length (km)</td>
<td>Percent Total Length</td>
<td>Length (km)</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>0</td>
<td>0.66</td>
<td>3.9</td>
<td>0</td>
</tr>
<tr>
<td>Medium</td>
<td>0.66</td>
<td>2.3</td>
<td>0.90</td>
<td>5.3</td>
<td>0.18</td>
</tr>
<tr>
<td>Low</td>
<td>4.29</td>
<td>14.8</td>
<td>1.21</td>
<td>7.1</td>
<td>0.84</td>
</tr>
<tr>
<td>Negligible</td>
<td>1.05</td>
<td>3.6</td>
<td>0.10</td>
<td>0.6</td>
<td>0.15</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>6.00</td>
<td>20.7</td>
<td>2.86</td>
<td>16.97</td>
<td>1.17</td>
</tr>
<tr>
<td>Total Length of Habitat Evaluated</td>
<td>29.01</td>
<td>-</td>
<td>16.93</td>
<td>-</td>
<td>4.34</td>
</tr>
</tbody>
</table>

¹ Results are presented in the table as the length (kilometers) of stream with usable IP. For Chinook salmon the IP is rated as high, medium, low, and negligible. “Useable” habitat is defined as all of these classes combined (usable = high + medium + low + negligible).
² Does not include the East Fork SFSR tributaries Meadow Creek and EFMC
³ Total percent of IP habitat within the total length of streams evaluated

East Fork SFSR = East Fork South Fork Salmon River; YPP = Yellow Pine pit lake; EFMC = East Fork Meadow Creek
Figure 3.12-6
Chinook Salmon Intrinsic Potential Habitat Within the Mine Site Subwatershed
Stibnite Gold Project
Stibnite, ID

Base Layer: ESRI World Terrain Basemap
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Ecosystem Sciences; Boise National Forest; Payette National Forest

LEGEND

Subwatershed (HUC 12)
Chinook Salmon Intrinsic Potential

- High
- Medium
- Low
- Negligible
- None

Project Components
- Mine Site Components
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - Stream/River
  - Lake/Reservoir

Surface Management
- Private
- U.S. Forest Service

Boise National Forest
Payette National Forest
Frank Church-River of No Return Wilderness
Salmon-Challis National Forest
SUGAR CREEK HUC 12
HEADWATERS EAST FORK SOUTH FORK SALMON RIVER HUC 12

Yellow Pine Pit Lake
EastForkMeadow Creek
Fiddle Creek
Fern Creek
Garnett Creek
Rabbit Creek
Sugar Creek
West End Creek
Midnight Creek
Pyramid Creek
Cane Creek
Cinnabar Creek
Hennessy Creek
Meadow Creek
Sugar Creek

1 inch = 6,600 feet when printed at 8.5x11in
**Steelhead**

**Status**

The Snake River Basin Steelhead Distinct Population Segment (DPS) is found in the East Fork SFSR drainage and its tributaries downstream of the Yellow Pine pit lake. Steelhead were initially listed as federally threatened under the ESA in August 1997 (62 Federal Register 43937) with the geographic listing area including all natural-origin populations of steelhead in the Snake River Basin. In 2006, Snake River steelhead were subsequently reclassified as a threatened DPS (71 Federal Register 834).

The Interior Columbia Technical Recovery Team (ICTRT) identified five extant major population groups (MPGs) in the Snake River Basin steelhead DPS, which includes the Salmon River Steelhead MPG (ICTRT 2008 as cited in NMFS 2017). The Salmon River Steelhead MPG consists of 12 demographically different steelhead populations all of which are presently considered non-viable (NMFS 2017). The Salmon River Steelhead MPG includes the SFSR population (NMFS 2017), which is within the analysis area. This population is found within three major tributaries in the analysis area: the East Fork SFSR, Johnson Creek, and the Upper SFSR. The SFSR steelhead population is considered “maintained,” with a tentative moderate abundance/productivity risk and low distribution and diversity risk (ICTRT 2008). This population is targeted to achieve a proposed status of “viable,” which requires a minimum of low abundance/productivity risk.

**Critical Habitat**

The final rule designating Critical Habitat was implemented in January 2006 (70 Federal Register 52630). Critical Habitat for Snake River Basin steelhead is designated throughout much of the analysis area (Figure 3.12-7). Within the areas directly affected by construction and operations, Critical Habitat is designated in the East Fork SFSR drainage to approximately 0.4 km upstream of the confluence with Sugar Creek, including Sugar Creek, and two creeks in the Johnson Creek watershed, Burntlog Creek, and Riordan Creek. Critical habitat for steelhead is not designated upstream of the Yellow Pine pit lake; however, it is assumed that steelhead were found in the headwaters of the East Fork SFSR prior to 1938. The Yellow Pine pit lake cascade barrier precludes steelhead from migrating upstream of the Yellow Pine pit lake, however, NMFS does not consider habitat upstream from the Yellow Pine pit lake to be designated Critical Habitat for steelhead (70 Federal Register 52630).

**Physical and Biological Features and Recovery Plan**

Physical and biological features are the same as previously described under Chinook Salmon above. The 2017 NMFS Recovery Plan included recovery strategies for Salmon River steelhead.

**Temperature Requirements and Baseline**

Steelhead have different thermal requirements or limitations for their various life stages. Exceeding thresholds could impact various life-stages and could cause fish to avoid areas or even mortality. The periodicity of each life stage and the accepted stream temperature threshold ranges for various temperature considerations for each species were compiled from regulatory standards and other relevant literature (ESS 2019a), a condensed version of which is provided in Table 3.12-4.
Using the QUAL2K predicted MWMT values and stream segment lengths from the SPLNT Model Refined Modified Proposed Action (ModPRO2) report (Brown and Caldwell 2021i), the length of proposed mine site streams within these temperature thresholds was estimated. Similar to Chinook salmon, the QUAL2K stream segments that contain the segments in which there was modeled IP habitat (see Intrinsic Potential under Distribution section below) were evaluated for thermally suitable habitat for all life stages. Therefore, the lengths of habitat are not identical, meaning the length of habitat meeting the temperature thresholds may be longer than the length of habitat with IP.

Table 3.12-4 shows that of the entire 2.01 km of potential habitat is within the temperature thresholds for juvenile rearing, 0.89 of which is upstream from the Yellow Pine pit lake cascade barrier. It is important to note that the length of potential habitat for steelhead incubation is based on July MWMTs, however, there are diurnal variations and hyporheic conditions that protect the eggs and alevins reducing mortality rates. Therefore, while summer temperature thresholds may show zero miles of suitable habitat, this may not be a true representation of the conditions in the river.

It is important to note that the creeks do experience significant diurnal variations, and that for mobile life stages (i.e., adults and juveniles), if temperatures are above the thresholds, fish present may avoid areas within streams if they are able, such as finding thermal refuges.

### Table 3.12-4 Steelhead Optimal Temperature Thresholds and Modeled Length of Stream within the Water Temperature Thresholds

<table>
<thead>
<tr>
<th>Life Stage / Season¹</th>
<th>Range of Optimal Temperature Thresholds (°C)</th>
<th>Total Stream Length Above YPP/ Below YPP</th>
<th>Stream Length within Optimal Temperature Threshold Above YPP</th>
<th>Below YPP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Migration/ March – May</td>
<td>12-19</td>
<td>0 / 2.01</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Adult Spawning/ April – June</td>
<td>4-14</td>
<td>0 / 2.01</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Incubation/Emergence/ April – August²</td>
<td>6-10</td>
<td>0 / 2.01</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Juvenile Rearing/ Year-round²</td>
<td>10-17</td>
<td>0 / 2.01</td>
<td>2.01</td>
<td>2.01 (100%)³</td>
<td></td>
</tr>
</tbody>
</table>

Source: EPA 2003, IDAPA 2022, Poole et al. 2001

¹ It should be noted that the months in the life stage are not applicable for comparison to the SPLNT model results

² Analysis based Summer Maximum (July) 7-Day Average of the Daily Maximum

³ Percent of stream length within the usable Intrinsic Potential habitat

°C = degrees Celsius; km = kilometer; YPP = Yellow Pine pit

### Distribution

Steelhead occur throughout much of the analysis area (Figure 3.12-7), but within the areas affected by construction and operation, their distribution in the East Fork SFSR, up to Yellow Pine pit where a steep high gradient riffle/cascade caused by past mining activities is thought to preclude upstream migration. Steelhead can maneuver through higher gradients than Chinook salmon; however, genetic sampling suggest such migration does not occur above the Yellow Pine pit lake.
LEGEND
- Steelhead Critical Habitat
- Analysis Area
- Aquatic Survey Locations
- Steelhead
  - Present
  - Not Detected

Project Components *
- SGP Features
- Utilities
- Existing Communication Tower
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
  - Railroad
  - Stream/River
  - Lake/Reservoir

Surface Management
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- State Fish and Game
- State Parks and Recreation
- U.S. Forest Service


Note: The two "Present" observations in Meadow Creek and East Fork Meadow Creek may be golden trout released in the upper watershed.

Figure 3.12-7 Steelhead Distribution and Designated Critical Habitat in the South Fork Salmon River Subbasin
Stibnite Gold Project
Stibnite, ID


Note: The two "Present" observations in Meadow Creek and East Fork Meadow Creek may be golden trout released in the upper watershed.
Little is known about steelhead use of the Yellow Pine pit lake, but it is likely the distribution is limited. In 2018 and 2019, only 5 and 9 *O. mykiss* were identified in Yellow Pine pit lake, respectively, and were noted as rainbow trout due to the size and time of year of capture (Brown and Caldwell 2019b, 2020b). Unlike Chinook salmon (via trap and haul) and bull trout, steelhead have not been found upstream of the Yellow Pine pit lake since the initiation of mining (given no documentation prior to mining, it is unknown if they occurred prior to mining activities). However, it is possible some migrating steelhead adults may use Yellow Pine pit lake as a holding area before migrating downstream to more suitable spawning grounds. Similarly, the lake may be used for rearing by some juvenile steelhead that have dispersed upstream from downstream spawning areas (Brown and Caldwell 2019b).

Steelhead occurrence in the analysis area varies by life stage and season. Adult migration occurs between mid-March through May. Spawning occurs from April to mid-June. Incubation/emergence occurs between April and mid-August. Juvenile rearing occurs year-round, with out-migration occurring primarily in June through and September. Life stage periodicity tables are presented in ESS 2019b.

Habitat for steelhead is measured using two different tools – Flow productivity to determine the effect of stream flow changes on Steelhead productivity and intrinsic potential modeling to determine the potential for streams to support spawning and early-rearing habitat.

*Flow Productivity*

Similar to Chinook salmon, the effects of streamflow changes on steelhead productivity within the mine site area are based upon a SGP flow-productivity model that was developed using the flow-productivity modeling approach for the Big Creek Water Diversion Project (NMFS 2013). The SGP flow-productivity model uses proxy data from the Lemhi River and assumes that the physical and biological conditions in the Lemhi River are relatable to the mine site streams. However, there are many physical differences between the upper East Fork SFSR and the Lemhi River, including drainage size, flow regime and steelhead populations. Also, the SGP flow-productivity model assumes a fixed number of steelhead spawners each year that occurred in the Lemhi River to occur across all of the mine sites (ESS 2021). Therefore, these flow-productivity estimates provide a rough approximation of changes in productivity due to flow within the mine site. Additionally, the differences in streamflow regimes, physical habitat characteristics, population sizes, and other differences between Johnson Creek and the mine site streams creates uncertainty that cannot be addressed with the available data.

The flow-productivity analysis predicts changes in productivity based solely on streamflow changes and it does not factor in additional habitat changes that would also occur in the analysis area (e.g., direct loss of habitat, water temperature changes, etc.). The model outputs help to show the relative effects of flow modifications on steelhead productivity at the reach level. Steelhead productivity was assessed in four stream reaches (East Fork SFSR above Meadow Creek, East Fork SFSR at Stibnite, East Fork SFSR above Sugar Creek, and lower Meadow Creek). The lower Meadow Creek site (MC-6) was set up to supplement the system of USGS gages. MC-6 specifically examines conditions in the portion of Meadow Creek that is routed through a constructed channel to divert the stream away from historical mine waste.
The flow-productivity model outputs productivity values that are compared to baseline productivity values to calculate the predicted annual percent change in steelhead productivity from baseline productivity. The baseline steelhead productivity value of 1.24 was derived from productivity data collected on the Lemhi River (NMFS 2013). Again, the interpretation of the predicted annual percent change in productivity is based upon the baseline productivity calculated with the Lemhi River data because data is not available within the mine site. Because the productivity value is greater than 1.0, if Lemhi River were an unimpaired system, there would be slightly more returning adults than the spawning brood year.

**Intrinsic Potential**

The IP model was applied to classify the potential for spawning and rearing habitat for steelhead in headwaters of the East Fork SFGR subwatershed (Figure 3.12-6). This area encompasses the mine site area, which includes the East Fork SFGR and tributaries upstream from Yellow Pine pit, Meadow Creek and EFMC, East Fork SFGR and tributaries between Yellow Pine pit and Sugar Creek, and East Fork SFGR downstream from Sugar Creek. Over 51 km were evaluated for IP for steelhead, and under baseline conditions, modeled IP stream length show approximately 10.7 km of potential spawning and early-rearing habitat for steelhead in the mine site area (Table 3.12-5). As shown in Figure 3.12-8, high-rated and low-rated steelhead spawning and early-rearing habitat potentially occurs throughout the East Fork SFGR and Meadow Creek and the additional section of the East Fork SFGR below the confluence with Sugar Creek.

### Table 3.12-5  Steelhead Intrinsic Potential Modeling Results for Existing/Baseline Conditions

<table>
<thead>
<tr>
<th>Steelhead IP¹</th>
<th>East Fork SFGR and Tributaries Upstream from YPP²</th>
<th>Meadow Creek and EFMC</th>
<th>East Fork SFGR and Tributaries between YPP and Sugar Creek</th>
<th>East Fork SFGR Downstream from Sugar Creek</th>
<th>Total IP Habitat in Mine Site Area (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length (km)</td>
<td>Percent Total Length</td>
<td>Length (km)</td>
<td>Percent Total Length</td>
<td>Length (km)</td>
</tr>
<tr>
<td>High</td>
<td>2.16</td>
<td>7.4</td>
<td>2.18</td>
<td>12.9</td>
<td>0.18</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
<td>0</td>
<td>0.60</td>
<td>3.5</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>2.91</td>
<td>10.0</td>
<td>0.87</td>
<td>5.1</td>
<td>0.72</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>5.07</td>
<td>17.5</td>
<td>3.65</td>
<td>21.6</td>
<td>0.90</td>
</tr>
<tr>
<td>Total Length of Habitat Evaluated</td>
<td>29.01</td>
<td>-</td>
<td>16.93</td>
<td>-</td>
<td>4.34</td>
</tr>
</tbody>
</table>

1 Results are presented in the table as the length (km) of stream with usable IP. For steelhead, the IP is rated as high, medium, low, and negligible. “Useable” habitat is defined as all of these classes combined (usable = high + medium + low + negligible).

2 Does not include the East Fork SFGR tributaries Meadow Creek and EFMC.

3 Total percent of IP habitat within the total length of streams evaluated.

East Fork SFGR = East Fork South Fork Salmon River; YPP = Yellow Pine pit lake; EFMC = East Fork Meadow Creek.
Figure 3.12-8
Steelhead Intrinsic Potential Habitat Within the Mine Site Subwatershed
Stibnite Gold Project
Stibnite, ID

LEGEND
Subwatershed (HUC 12)
Steelhead Intrinsic Potential
- High
- Medium
- Low
- Negligible
- None

Project Components
Mine Site Components
Surface Management
Private
U.S. Forest Service

Other Features
U.S. Forest Service
Wilderness
County
Stream/River
Lake/Reservoir

Base Layer: ESRI World Terrain Basemap
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Ecosystem Sciences; Boise National Forest; Payette National Forest
**Bull Trout**

**Status**

The USFWS listed the Columbia River DPS of bull trout as threatened in June 1998 (63 Federal Register 31647). Bull trout are currently known to use spawning and rearing habitat in at least 28 streams within the SFSR subbasin, including Burntlog Creek, Trapper Creek, Riordan Lake, East Fork SFSR, Sugar Creek, Tamarack Creek, and Profile Creek. IDFG trend data indicates that the geographic extent of bull trout is increasing (IDFG 2005b). Potential threats to the population within the SFSR subbasin include connectivity impairment, habitat degradation, and competition from invasive brook trout (USFWS 2015a); however, fish sampling has not documented brook trout in any of the mine site streams, but this species may occur in several streams in the vicinity of the Burntlog Route (Adams et al. 2002).

**Critical Habitat**

Within the analysis area, the USFWS has designated Critical Habitat for bull trout throughout the South Fork Salmon watershed, including but not limited to in the East Fork SFSR, and in Burntlog, Cane, Cinnabar, Meadow, Tamarack, Trapper, Riordan, and Sugar creeks (75 Federal Register 63898). Figure 3.12-9 shows the occurrence locations of bull trout and designated Critical Habitat in the analysis area.

**Physical and Biological Features and Recovery Plan**

Primary constituent elements are physical and biological features that are essential to the conservation of the species. For bull trout these include but are not limited to space for individual and population growth and for normal behavior; food, water, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species (USFWS 2010).

The most recent 5-year status review for bull trout was published in April 2008 (USFWS 2008); however, a new 5-year review is currently in progress (85 Federal Register 14240; March 11, 2020). The 2008 review concluded that listing the species as “threatened” remained warranted range-wide in the coterminous U.S. Based on this status review, the 2010 recovery report to Congress stated that bull trout were generally “stable” range wide. Since the listing of bull trout, there has been very little change in the general distribution in the coterminous U.S.

The 2015 Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2015a) provided recovery unit implementation plans for specific recovery units, including the Upper Snake Recovery Unit, which includes bull trout in the analysis area.

Large areas of intact habitat exist primarily in the Salmon River drainage, which is the only drainage in the Upper Snake Recovery Unit that still flows directly into the Snake River (USFWS 2015a).
Bull trout exhibit three life-history strategies in the analysis area: fluvial (stream and river dwelling, spawning in small tributaries); adfluvial (lake dwelling and river spawning); and non-migratory or resident (found in small streams and headwater tributaries). Historically, the Upper Snake Recovery Unit is believed to have largely supported the fluvial life history form; however, many core areas are now isolated or have become fragmented watersheds, resulting in replacement of the fluvial life history with resident or adfluvial forms. The USFWS identified threats to bull trout persistence as “the combined effects of habitat degradation, fragmentation and alterations associated with dewatering, road construction and maintenance, mining, grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species” (64 Federal Register 58910).

Temperature Requirements and Baseline

Bull trout have different thermal requirements or limitations for their various life stages. Exceeding thresholds could impact various life-stages and could cause fish to avoid areas or even mortality. The periodicity of each life stage and the accepted stream temperature threshold ranges for various temperature considerations for each species were compiled from regulatory standards and other relevant literature (ESS 2019a), a condensed version of which is presented in Table 3.12-6.

Using the QUAL2K predicted MWMT values and stream segment lengths from the SPLNT Existing Conditions report (Brown and Caldwell 2018a), the length of proposed mine site streams within these temperature thresholds was estimated (Table 3.12-6). The QUAL2K stream segments that contain the segments in which there was modeled habitat with occupancy probability were evaluated for thermally suitable habitat for all life stages. However, it is important to note, an Occupancy Model (OM) developed for bull trout (see below) applied more refined spatial scale (i.e., shorter reaches) than were applied in the SPLNT model. Hence, the stream segments evaluated for temperature could have lengths that extended beyond the ends of the segments evaluated for OM. Therefore, the lengths of habitat are not identical, meaning the length of habitat meeting the temperature thresholds may be longer than the length of habitat per the OM.

The East Fork SFSR from 0.89 km downstream from the confluence with Sugar Creek to around 5 km upstream from the confluence with Meadow Creek, including Fiddle Creek (total of 12.94 km), and around 13.27 km of Meadow Creek and East Fork Meadow Creek were evaluated for the temperature thresholds.

Overall, there are 26.21 km of available habitat, none of it is within optimal thresholds for incubation/emergence, almost half of it is optimal for juvenile rearing, approximately 6 percent is within the thresholds for adult spawning.
LEGEND
- Analysis Area
- Bull Trout Critical Habitat
- Aquatic Survey Locations Bull Trout
  - Present
  - Not Detected
- Project Components *
- SGP Features
- Utilities
  - Existing Communication Tower
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
- Railroads
- Highways
- Roads
- Stream/River
- Lake/Reservoir
- Surface Management Agency
  - Bureau of Land Management
  - Bureau of Reclamation
  - Private
  - State
  - State Fish and Game
  - State Parks and Recreation
  - U.S. Forest Service


Figure 3.12-9
Bull Trout Distribution and Designated Critical Habitat in the South Fork Salmon River Subbasin Stibnite Gold Project Stibnite, ID
Table 3.12-6  Bull Trout Optimal Temperature Thresholds and Modeled Length of Stream within the Water Temperature Thresholds

<table>
<thead>
<tr>
<th>Life Stage / Season</th>
<th>Range of Optimal Water Temperature Thresholds (°C)</th>
<th>Total Stream Length Above YPP / Below YPP</th>
<th>Stream Length Within Optimal Water Temperature Threshold (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Above YPP / Below YPP</td>
<td>Total</td>
</tr>
<tr>
<td>Adult Spawning/ August – September¹</td>
<td>4 – 9</td>
<td>24.20 / 2.01</td>
<td>1.62 / 0</td>
</tr>
<tr>
<td></td>
<td>9 – 10</td>
<td>24.20 / 2.01</td>
<td>7.76 / 0</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>24.20 / 2.01</td>
<td>14.82 / 2.01</td>
</tr>
<tr>
<td>Incubation/Emergence/ April – August¹</td>
<td>2 – 5</td>
<td>24.20 / 2.01</td>
<td>0 / 0</td>
</tr>
<tr>
<td></td>
<td>5 – 6</td>
<td>24.20 / 2.01</td>
<td>0 / 0</td>
</tr>
<tr>
<td></td>
<td>&gt;6</td>
<td>24.20 / 2.01</td>
<td>24.20 / 2.01</td>
</tr>
<tr>
<td>Juvenile Rearing/ Year-round³</td>
<td>4 – 12</td>
<td>24.20 / 2.01</td>
<td>12.16 / 0</td>
</tr>
<tr>
<td></td>
<td>12 – 15</td>
<td>24.20 / 2.01</td>
<td>9.60 / 2.01</td>
</tr>
<tr>
<td></td>
<td>&gt;15</td>
<td>24.20 / 2.01</td>
<td>2.43 / 0</td>
</tr>
</tbody>
</table>

Source: EPA 2003, Forest Service 2003a

¹ Analysis based on Fall Maximum 7 Day Average of the Daily Maximum
² Percent of stream length is based on the modeled potential habitat
³ Analysis based Summer Maximum 7 Day Average of the Daily Maximum

°C = degrees Celsius; > = greater than; % = Percent; km = kilometer; FA = Functioning Appropriately; FR = Functioning at Risk; FUR = Functioning at Unacceptable Risk; km = kilometer; YPP = Yellow Pine pit

It is important to note that the length of potential habitat for bull trout incubation is based on September MWMTs; however, there are diurnal variations and hyporheic conditions that protect the eggs and alevins reducing mortality rates. Additionally, while the length of stream above and below the Yellow Pine pit are not FA and often even FR, there are all life stages of bull trout present, which means successful reproduction is occurring. Therefore, while fall MWMTs may show zero miles of suitable spawning and incubation habitat, this may not be a true representation of the conditions in the river. Additionally, if MWMTs for mobile life stages (i.e., adults and juveniles) are above the thresholds, fish present may avoid areas within streams if they are able, such as finding thermal refuges.

Distribution

Figure 3.12-9 displays the distribution of bull trout in the analysis area. Bull trout are not found outside of the SFSR subbasin within the analysis area (Burns et al. 2005). Bull trout occupy most streams affected by both construction and operations of the SGP (MWH 2017).

A subpopulation of bull trout using an adfluvial life history strategy uses the Yellow Pine pit lake for overwintering, with downstream migration to tributaries for spawning (Hogen and Scarnecchia 2006). Hogen and Scarnecchia (2006) found bull trout overwintered in the large rivers downstream of the East Fork SFSR (SFSR and the Salmon River further downstream), and then migrated upstream to the East Fork SFSR in June and July, and further into small tributaries to spawn in August and September.
Migrants stage at the mouths of presumptive spawning tributaries from mid-July to mid-August, then migrate into tributaries to spawn from mid-August to mid-September. ESS 2019h provides more detail regarding bull trout use of the Yellow Pine pit lake.

Fluvial populations downstream from the Yellow Pine pit lake quickly out-migrate as far as the mainstem Salmon River (Hogen and Scarnecchia 2006) or move up to the Yellow Pine pit lake for overwintering. The Yellow Pine pit cascade barrier blocks upstream passage of fluvial populations. Upstream from the Yellow Pine pit cascade barrier, bull trout use either the fluvial or the resident life-history strategy. The extent of available habitat upstream of the Yellow Pine pit lake is limited by gradient barriers, as well, the access to upstream habitat by fluvial populations downstream from the Yellow Pine pit barrier is blocked.

Habitat for bull trout is measured using two different tools – Occupancy modeling to determine occupancy probability and looking at how changes in stream flow affects the amount of available habitat through the use of PHABSIM modeling.

**Occupancy Probability**

The OM is a tool used to determine the probability of a fish species occupying a particular stream reach (occupancy probability) and to predict changes in the probability given changes to site physical characteristics (Isaak et al. 2015, 2017). The OM was adapted to the scale of the mine site study area and uses data collected at the mine site. The mine site OM quantifies potential habitat for each stream reach by assigning probabilities (expressed as a percent from 0 to 100) that each of the species would occur in a given stream reach. The length of a stream reach has either a low, medium-low, medium-high, or high occupancy probability (referred to as “available habitat”), which are based on the quartile in which the occupancy probability falls within the range of results for the model year. That is, the first quartile, or the lowest 25 percent, represents a low occupancy probability, and the fourth quartile, or the highest 25 percent, represents a high occupancy probability. Greater detail regarding occupancy modeling is presented in ESS 2019f.

A distance-weighted average was used to represent the average occupancy probability of each stream segment, in other words, the usability of habitat for bull trout. This was calculated by multiplying the proportion of the OM stream reach length within the stream segment (e.g., East Fork SFSR upstream of Meadow Creek) with the occupancy probability of each OM stream reach within the stream segment.

Occupancy modeling methods originate from studies completed by the Rocky Mountain Research Station, a group of scientists funded by the USDA (Isaak et al. 2015, 2017). The occupancy modeling was based on three site physical characteristic variables: stream discharge (i.e., flow), summer stream temperature, and reach slope (Isaak et al. 2017). As part of the Rocky Mountain Research Station studies, data on stream reach variables for large stream networks in the Rocky Mountains (primarily in Idaho and western Montana) were fit to bull trout and westslope cutthroat trout occurrence datasets (presence/absence data) to create parameter estimates used in a logistic regression model. The resulting parameter estimates of the model can be used to estimate occupancy probabilities for specific areas within any given stream reach where stream flow, summer water temperatures and reach slope are known. For example, an occupancy probability of 10 percent implies that a species will be present in one out of every ten reaches with similar characteristics (temperature, flow and slope) across the region (Rocky
Mountains) used to fit the model. Understanding the distinction between the scale of the Isaak et al. 2017 model and the scale of the SGP OM model is important for placing the results in context.

A site-specific OM was developed to employ the logistical regression derived from the Rocky Mountain Research Station study to estimate probabilities for both bull trout and westslope (ESS 2019f): East Fork SRSR upstream from the Meadow Creek confluence; Meadow Creek including the EFMC; East Fork SFSR upstream from the Yellow Pine pit lake and the Meadow Creek confluence, and the East Fork SFSR from the Yellow Pine pit lake and the Sugar Creek confluence. The regression model utilizes parameter values for reach slope, stream discharge, and water temperature to quantify changes in occupancy probability. This model differs from other analytical approaches in this section which utilize comparisons of parameter values such as stream temperatures to threshold values. The OM model regression relates changes in occupancy probability to changes in one of the three model variables, for example, resulting in an incremental reduction in occupancy probability with an increase in stream temperature, as opposed to a complete reduction upon exceedance of a threshold value. Therefore, because the OM model applies a regression of multiple parameters to the refined stream reaches above, it may provide different results than examination of individual parameters compared to threshold values.

Lengths of habitat and distance-weighted occupancy probabilities for bull trout for each stream reach are presented in Table 3.12-7. In total, the East Fork SFSR subwatershed contains 33.9 km of habitat available for potential occupancy for bull trout, which is about 66.9 percent of the total length of stream modeled (50.6 km). Bull trout have not been observed nor their DNA detected in the upper East Fork Meadow Creek nor in Fiddle Creek (MWH 2017), so may not occur in these two systems. Passage into both the upper East Fork Meadow Creek and Fiddle Creek would not be provided as a result of the project. Therefore, while the model provides occupancy probabilities for these creeks, it does not mean that bull trout do occur, or would occur as a result of the SGP.

A distance-weighted average method was used to represent the average occupancy probability for each stream segment, shown in Table 3.12-7. To produce the distance-weighted average, the occupancy probability of each OM reach was multiplied by the proportion of the reach’s stream length to the total length of each stream segment that has some likelihood of being occupied by bull trout. Based on the model, the Headwaters East Fork SFSR subwatershed has an estimated distance-weighted average total occupancy probability for bull trout of 7.9 percent for portions of stream reaches with low to high occupancy probabilities. The relatively low occupancy probability numbers for bull trout (less than 20 percent) indicate a higher sensitivity to the model input parameters, particularly water temperature and flow.
Table 3.12-7  Length of Available Habitat and Distance Weighted Average in Percent Occupancy Probability for Bull Trout Under Baseline Conditions

<table>
<thead>
<tr>
<th>Occupancy Category</th>
<th>EFSFSR Upstream from Meadow Creek</th>
<th>Meadow Creek and EFMC</th>
<th>EFSFSR Between Meadow Creek and YPP Lake</th>
<th>EFSFSR Between YPP Lake and Sugar Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>km</td>
<td>OP</td>
<td>km</td>
<td>OP</td>
</tr>
<tr>
<td>High</td>
<td>1.59</td>
<td>18.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Medium-High</td>
<td>4.82</td>
<td>11.5</td>
<td>3.45</td>
<td>10.42</td>
</tr>
<tr>
<td>Medium-Low</td>
<td>2.52</td>
<td>6.3</td>
<td>3.43</td>
<td>6.72</td>
</tr>
<tr>
<td>Low</td>
<td>4.19</td>
<td>2.3</td>
<td>6.18</td>
<td>2.54</td>
</tr>
<tr>
<td>Total</td>
<td>13.12</td>
<td>8.4</td>
<td>13.06</td>
<td>5.72</td>
</tr>
</tbody>
</table>

EFMC = East Fork Meadow Creek; East Fork SFSR = East Fork South Fork Salmon River; OP = Occupancy Probability; YPP = Yellow Pine pit

**Stream Flow (Physical Habitat Simulation [PHABSIM])**

Physical Habitat Simulation (PHABSIM) is a modelling technique that predicts the amount of potential fish habitat in a stream or river associated with different volumes of streamflow. First developed by USFWS, the PHABSIM model is widely used as a tool to understand the relationship between streamflow and potential fish habitat. In the late 1980s and early 1990s, the Forest Service conducted a PHABSIM modeling study at several stream locations in the East Fork SFSR watershed as part of the Snake River Basin Adjudication (Maret et al. 2006). The results of this previous study are informative in understanding the potential effects of the SGP on fish habitat. PHABSIM was used for bull trout and cutthroat trout because there was not a similar productivity analysis (ESS 2019g) as was done for Chinook salmon because that is a NMFS-derived method, and therefore has only been completed for ESA species. A summary of the PHABSIM model is provided below. A detailed description of the model and results are provided in ESS 2019g.

The PHABSIM model calculates an index of the amount of microhabitat available for target organisms and life stages at different flow levels, incorporating two major analytical components: stream hydraulics and organism/life stage-specific habitat requirements. These calculations are based on three physical variables: water depth, water velocity, and substrate composition (i.e., streambed particle size). The model uses discrete values of water depth and velocity data collected at a given stream site to simulate the same variables over a broad range of stream flows of interest. Substrate does not change in the model over the range of simulated flows. For each streamflow of interest, the model converts the simulated physical variables into equivalent values of potential fish habitat. This conversion is based on a functional relationship between the three physical variables and fish habitat suitability. Separate conversions were performed in the model for different species (bull trout and cutthroat trout) and life stages of fish. Model output is expressed as Weighted Usable Area (WUA), which represents the square feet of usable habitat per 1,000 feet of stream.
To determine general and relative relationships between streamflow and habitat in the mining reaches, the PHABSIM study compared representative streams that contained similar hydrological and geographical characteristics to the stream characteristics at the proposed mine site. This comparative analysis yielded a general grouping of the PHABSIM study site and proposed mine site streams into three index categories, basically reflecting stream size and discharge: Index 1 (small streams); Index 2 (medium size streams); and Index 3 (large streams). At the proposed mine site, each stream reach (defined below) was assigned an index (Table 3.12-8). For example, Meadow Creek and the East Fork SFSR upstream from Meadow Creek are represented by Stream Index 1, both of which are similar to the Summit Creek site of the PHABSIM study.

<table>
<thead>
<tr>
<th>Mine Site Stream Reach</th>
<th>Stream Index Number</th>
<th>Representative Stream in PHABSIM Analysis</th>
<th>Representative Mean Discharge (cfs)</th>
<th>Representative Mid-Point Discharge (cfs)</th>
<th>Representative Lower Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadow Creek and EFMC</td>
<td>1</td>
<td>Summit Creek</td>
<td>7.8</td>
<td>4.4</td>
<td>1</td>
</tr>
<tr>
<td>East Fork SFSR between Sugar Creek and YPP</td>
<td>2</td>
<td>Sugar Creek</td>
<td>9.9</td>
<td>5.4</td>
<td>1</td>
</tr>
<tr>
<td>East Fork SFSR at Stibnite</td>
<td>3</td>
<td>East Fork SFSR Downstream from Sugar Creek</td>
<td>63</td>
<td>44</td>
<td>25</td>
</tr>
</tbody>
</table>

cfs = cubic feet per second; East Fork SFSR = East Fork South Fork Salmon River; PHABSIM = Physical Habitat Simulation; YPP = Yellow Pine pit

PHABSIM model output generates a significant volume of information on the relationship between streamflow and WUA (Table 3.12-9). To simplify model output for the purposes of evaluating fish habitat effects of the SGP, two refinements were made to the model results. First, the model output used for the proposed mine site centered on the low-flow period of the year, defined as the months of August through March. Second, the WUA for different life stages of bull trout were evaluated for three key stream flows within the low-flow period: the mean discharge rate, a lower rate close to the minimum discharge rate value for the period, and a mid-point rate between the mean and minimum values (Table 3.12-9).

The quantification of potential SGP impacts on bull trout and cutthroat trout habitat, as defined by WUA, is dependent on several factors. One important factor is the predicted change in baseline flows that would occur in the various mine site stream reaches. Unique changes would occur in each reach throughout the life of the SGP. Another factor is the non-linear relationship between flow and WUA for each fish life stage. The PHABSIM model predicts separate habitat values for all species and all life stages of interest for several stream flow rates, which when viewed graphically, represent a non-linear relationship. Lastly, the PHABSIM model results are based upon WUA data collected from index streams that do not exactly represent the physical and biological conditions of the mine site stream reaches.
Table 3.12-9  Bull Trout Weighted Usable Area for Three Discharge Rates for Representative Streams

<table>
<thead>
<tr>
<th>Representative Stream</th>
<th>Discharge</th>
<th>Weighted Usable Area¹</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Summit Creek (Index 1)</td>
<td>7.8²</td>
<td>2,505</td>
<td>0</td>
<td>N/A</td>
<td>ND</td>
<td>5,940</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.4</td>
<td>1,451</td>
<td>-42</td>
<td>0</td>
<td>N/A</td>
<td>3,524</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>261</td>
<td>-90</td>
<td>0</td>
<td>N/A</td>
<td>635</td>
<td></td>
</tr>
<tr>
<td>Sugar Creek (Index 2)</td>
<td>9.9²</td>
<td>1,176</td>
<td>-2,127</td>
<td>--</td>
<td>ND</td>
<td>2,709</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.4</td>
<td>746</td>
<td>-37</td>
<td>1,443</td>
<td>-32</td>
<td>ND</td>
<td>1,811</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>144</td>
<td>-88</td>
<td>66</td>
<td>-97</td>
<td>ND</td>
<td>351</td>
</tr>
<tr>
<td>East Fork SFSR Downstream of Sugar Creek (Index 3)</td>
<td>63²</td>
<td>2,184</td>
<td>0</td>
<td>N/A</td>
<td>ND</td>
<td>4,900</td>
<td></td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>1,846</td>
<td>-15</td>
<td>0</td>
<td>N/A</td>
<td>4,340</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>1,108</td>
<td>-49</td>
<td>0</td>
<td>N/A</td>
<td>2,690</td>
<td></td>
</tr>
</tbody>
</table>

¹ Weighted Usable Area is defined as the sum of stream surface area within a study site, weighted by multiplying area by habitat suitability variables (most often velocity, depth, and substrate or cover), which range from 0.0 to 1.0 each, and normalized to square units (either feet or meters) per 1000 linear units.

² This value is the mean low-flow-period discharge rate.

ND: No data were available from the PHABSIM study; N/A: not applicable.
**Westslope Cutthroat Trout**

**Status**

Due to declines in distribution and abundance, westslope cutthroat trout (cutthroat trout) is designated by the Forest Service as a sensitive species. There was a petition to list westslope cutthroat trout as a threatened species under ESA (63 Federal Register 31691); however, the USFWS determined that such a listing was not warranted (65 Federal Register 20120 April 2000).

**Temperature Requirements and Baseline**

Cutthroat trout have different thermal requirements/limitations for their various life stages. The periodicity of each life stage and the accepted stream temperature thresholds/ranges for various temperature considerations for each species were compiled from regulatory standards and other relevant literature (ESS 2019a).

Overall, there is minimal habitat suitable for incubation/emergence, but a significant portion of the usable habitat is within the temperature thresholds for juvenile rearing (**Table 3.12-10**). It is important to note that the length of potential habitat for westslope cutthroat trout incubation is based on September MWMTs; however, there are diurnal variations and hyporheic conditions that protect the eggs and alevins reducing mortality rates. Additionally, while the length of stream above and below the Yellow Pine pit do not always meet the thermal requirements, there are all life stages of cutthroat trout present, which means successful reproduction is occurring. Therefore, while fall MWMTs may show less than one mile of suitable incubation habitat, this may not be a true representation of the conditions in the river. Additionally, if MWMTs for mobile life stages (i.e., adults and juveniles) are above the thresholds, fish may avoid areas within streams if they are able, such as finding thermal refuges.

**Table 3.12-10 Westslope Cutthroat Trout Optimal Temperature Threshold Ranges and Modeled Length of Stream within the Water Temperature Thresholds**

<table>
<thead>
<tr>
<th>Life Stage / Season</th>
<th>Range of Water Temperature Thresholds (°C)</th>
<th>Total Stream Length Above YPP / Below YPP</th>
<th>Stream Length Within Water Temperature Threshold (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Above YPP</td>
</tr>
<tr>
<td>Adult Migration/ March – June</td>
<td>15 – 19</td>
<td>24.10 / 2.01</td>
<td>--</td>
</tr>
<tr>
<td>Adult Spawning/ April – mid-July</td>
<td>4 – 14</td>
<td>24.10 / 2.01</td>
<td>--</td>
</tr>
<tr>
<td>Incubation/Emergence/ April – August¹</td>
<td>6 – 10</td>
<td>24.10 / 2.01</td>
<td>0.85</td>
</tr>
<tr>
<td>Juvenile Rearing/ Year-round¹</td>
<td>10 – 20</td>
<td>24.10 / 2.01</td>
<td>23.34</td>
</tr>
</tbody>
</table>


¹ Analysis based on Summer Maximum (July) 7-day average of the daily maximum
² Percent of stream length within modeled potential habitat.

°C = degrees Celsius; % = Percent; km = kilometer; YPP = Yellow Pine pit
Distribution

Cutthroat trout are not found outside of the SFSR subbasin within the analysis area. They are found both upstream and downstream from the Yellow Pine pit lake. The distribution of westslope cutthroat trout in the analysis area is shown in Figure 3.12-10.

Cutthroat trout spatial and temporal occurrence in the analysis area varies by life stage, (e.g., juveniles using nursery and rearing habitat or spawning adults). Adult migration occurs between mid-March and July with the peak from mid-April to mid-June. Spawning occurs from late April to July when water temperatures are near 10°C. Peak spawning is between early May and early July. Incubation/emergence occurs between mid-April and September. Juvenile rearing occurs year-round. Emigration occurs between April and December. Life stage periodicity tables are presented in ESS 2019a.

Cutthroat trout begin to mature at age three, but usually spawn first at age four or five. Cutthroat trout may be resident (non-migratory carry out all life processes in tributaries), fluvial (migratory: reside in rivers and streams and migrate to tributaries to spawn), or adfluvial (lake-dwelling and migrate to tributaries to spawn).

Recent fish sampling was performed in the Yellow Pine pit lake to provide information on relative abundance and movement of cutthroat trout (Brown and Caldwell 2019b, 2020b). A total of 32 cutthroat trout were captured over three sampling events in May, July, and September 2018, leading to only one population estimate of 50 individuals. The movement study results showed the majority of the 32 tagged cutthroat trout remained in the Yellow Pine pit lake; only four moved downstream and were not detected returning upstream. The 2019 study resulted in population estimates ranging from 33 to 101 individuals. The size structure of westslope cutthroat trout was skewed towards larger fish. Fish less than 150- to 200-millimeter fork length were not found.

Habitat for Westslope cutthroat trout is measured using two different tools – Occupancy modeling to determine occupancy probability and looking at how changes in stream flow affects the amount of available habitat through the use of PHABSIM modeling.
Figure 3.12-10
Westslope Cutthroat Trout Distribution in the South Fork Salmon River Subbasin
Stibnite Gold Project
Stibnite, ID

LEGEND
Analysis Area
Aquatic Survey Locations
Cutthroat Trout
- Present
- Not Detected
Project Components
SGP Features
Utilities
Existing Communication Tower
Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir
Surface Management Agency
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- State Fish and Game
- State Parks and Recreation
- U.S. Forest Service

Boise National Forest
Payette National Forest
Salmon-Challis National Forest
Frank Church-River of No Return Wilderness

Base Layer: USGS Shaded Relief
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest

1 inch = 4.88 miles when printed at 11x17
**Occupancy Probability**

OM was performed for westslope cutthroat trout using the same approach as bull trout. In total, the Headwaters East Fork SFSR subwatershed contains nearly 34 km of stream channel that is potential usable habitat for western cutthroat trout (Table 3.12-11), based on OM results, which is approximately 67 percent of the total length of streams in the subwatershed (50.6 km). The Headwaters East Fork SFSR subwatershed has a distance-weighted average occupancy probability of 64.3 percent for portions of stream reaches with low to high occupancy probabilities and each reach within the subwatershed are presented in Table 3.12-11. The relatively high occupancy probability numbers for cutthroat trout (mostly greater than 60 percent) indicate a higher tolerance to the model input parameters, particularly water temperature and flow.

Descriptive statistics for lengths of available habitat and occupancy probabilities by stream reach are presented in detail in ESS 2019f.

**Table 3.12-11 Average Length of Available Habitat and Distance Weighted Average in Percent Occupancy Probability for Westslope Cutthroat Trout Under Baseline Conditions**

<table>
<thead>
<tr>
<th>Occupancy Category</th>
<th>EFSFSR Upstream of Meadow Creek</th>
<th>Meadow Creak and EFMC</th>
<th>EFSFSR Between Meadow Creek and YPP Lake</th>
<th>EFSFSR Between YPP Lake and Sugar Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>km</td>
<td>%OP</td>
<td>km</td>
<td>%OP</td>
</tr>
<tr>
<td>High</td>
<td>1.59</td>
<td>69.5</td>
<td>2.21</td>
<td>68.8</td>
</tr>
<tr>
<td>Medium-High</td>
<td>3.95</td>
<td>67.1</td>
<td>3.04</td>
<td>67.2</td>
</tr>
<tr>
<td>Medium-Low</td>
<td>3.78</td>
<td>64.3</td>
<td>3.68</td>
<td>64.1</td>
</tr>
<tr>
<td>Low</td>
<td>3.79</td>
<td>59.1</td>
<td>4.13</td>
<td>58.6</td>
</tr>
<tr>
<td>Total</td>
<td>13.12</td>
<td>64.3</td>
<td>13.06</td>
<td>63.9</td>
</tr>
</tbody>
</table>

EFMC = East Fork Meadow Creek; East Fork SFSR = East Fork South Fork Salmon River; YPP = Yellow Pine pit

**Stream Flows (PHABSIM)**

The same PHABSIM approach previously described for bull trout was used for westslope cutthroat trout. For each of the three discharge rates and Stream Index, Table 3.12-12 provides the WUA value for four westslope cutthroat trout life stages, along with a percentage reduction in WUA relative to the mean discharge rate WUA value.
Table 3.12-12 Westslope Cutthroat Trout Weighted Usable Area for Three Discharge Rates for Representative Streams

<table>
<thead>
<tr>
<th>Representative Stream</th>
<th>Discharge</th>
<th>Weighted Usable Area¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cfs</td>
<td>Adult</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>Percent</td>
</tr>
<tr>
<td></td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>Summit Creek (Index 1)</td>
<td>7.8²</td>
<td>2,007</td>
</tr>
<tr>
<td></td>
<td>-44</td>
<td>-56</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>-99</td>
</tr>
<tr>
<td>Sugar Creek (Index 2)</td>
<td>9.9²</td>
<td>1,687</td>
</tr>
<tr>
<td></td>
<td>-46</td>
<td>-53</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>-99</td>
</tr>
<tr>
<td>East Fork SFSR</td>
<td>63²</td>
<td>9,788</td>
</tr>
<tr>
<td>Downstream of Sugar</td>
<td>-30</td>
<td>6,640</td>
</tr>
<tr>
<td>Creek (Index 3)</td>
<td>25</td>
<td>3,196</td>
</tr>
</tbody>
</table>

¹ Weighted Usable Area is defined as the sum of stream surface area within a study site, weighted by multiplying area by habitat suitability variables (most often velocity, depth, and substrate or cover), which range from 0.0 to 1.0 each, and normalized to square units (either feet or meters) per 1000 linear units.

² These values are the mean low-flow-period discharge rate.

ND: No data were available from the PHABSIM study; N/A: not applicable
3.12.4.2 Fish Density

Fish density refers to the number of individuals per unit area (e.g., square meters) or volume (e.g., cubic meters). In this document, the term “linear density” is also discussed. Linear density as used here is the number of fish per linear length of stream, typically per meter. Because the wetted area of streams varies with flow, it is useful to have a metric that is non-flow dependent, (i.e., stream length).

Stream Estimates

Fish abundance data collected during snorkel surveys in the mine site area in 2015 were used in conjunction with fish mark-recapture survey data collected at the same sites at the same time to develop fish relative abundance and density estimates. The objective of comparing snorkeling abundance data to mark-recapture data was to develop a metric that could be applied to the large number of snorkeling sites evaluated from 2012 to 2015. The details of how fish densities were derived are included in AECOM 2020g.

Several approaches to estimating salmonid densities were applied to the mine site subwatersheds and these approaches are described in detail in MWH 2017 and GeoEngineers 2017. In summary, it was determined that fish densities based on the mark-recapture method represent fair to good estimates of the fish density for most stream reaches evaluated (GeoEngineers 2017). Note that this analysis determines fish densities that can be used to estimate the salmonid abundance at a specific stream reach at the time of sampling.

The results adjusting the salmonid species areal and linear densities at snorkel survey sites within and adjacent to the mine site subwatersheds from 2012 to 2015 are summarized in Table 3.12-13.
Table 3.12-13 Adjusted Salmonid Species Areal and Linear Densities at Snorkel Survey Sites Within and Adjacent to the Proposed Mine Site Subwatersheds from 2012 to 2015

<table>
<thead>
<tr>
<th>Site ID (Downstream to Upstream)</th>
<th>Stream</th>
<th>Location</th>
<th>Year(s) Sampled</th>
<th>Mean Site Length (m) / Width (m)</th>
<th>Mean Fish Density – fish/m² (Mean Fish Linear Density – fish/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chinook Salmon</td>
</tr>
<tr>
<td>MWH-033 East Fork SFSR</td>
<td>Upstream of Johnson Creek</td>
<td>2013</td>
<td>100/14.1</td>
<td>0.121 (1.701)</td>
<td>0.084 (1.174)</td>
</tr>
<tr>
<td>MWH-032 East Fork SFSR</td>
<td>Downstream of Tamarack Creek</td>
<td>2013, 2014</td>
<td>100/15.9</td>
<td>0.045 (0.675)</td>
<td>0.038 (0.574)</td>
</tr>
<tr>
<td>MWH-017 Tamarack Creek (control site)</td>
<td>Confluence with East Fork SFSR</td>
<td>2012-2014</td>
<td>97/5.7</td>
<td>0.017 (0.097)</td>
<td>0.034 (0.195)</td>
</tr>
<tr>
<td>MWH-009 East Fork SFSR</td>
<td>Downstream of Sugar Creek</td>
<td>2012, 2014</td>
<td>95.5/8.4</td>
<td>0.059 (0.495)</td>
<td>0.050 (0.417)</td>
</tr>
<tr>
<td>MWH-029 Sugar Creek</td>
<td>Lower Reach</td>
<td>2012-2014</td>
<td>97/5.5</td>
<td>0.021 (0.116)</td>
<td>0.019 (0.107)</td>
</tr>
<tr>
<td>MWH-010 Sugar Creek</td>
<td>Middle Reach</td>
<td>2012-2014</td>
<td>97/5.5</td>
<td>0.023 (0.125)</td>
<td>0.024 (0.130)</td>
</tr>
<tr>
<td>MWH-018 Sugar Creek</td>
<td>Upper Reach</td>
<td>2012-2015</td>
<td>95.2/5.1</td>
<td>0.003 (0.018)</td>
<td>0.011 (0.057)</td>
</tr>
<tr>
<td>MWH-020 Sugar Creek</td>
<td>Upstream of Cinnabar Creek</td>
<td>2012-2013</td>
<td>95.5/3.6</td>
<td>0.002 (0.007)</td>
<td>0.006 (0.021)</td>
</tr>
<tr>
<td>MWH-019 Cinnabar Creek</td>
<td>Lower Reach</td>
<td>2012-2015</td>
<td>93/2.8</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-021 Cane Creek</td>
<td>Lower Reach</td>
<td>2012-2013</td>
<td>55.5/3.0</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Site ID (Downstream to Upstream)</td>
<td>Stream</td>
<td>Location</td>
<td>Year(s) Sampled</td>
<td>Mean Site Length (m) / Width (m)</td>
<td>Mean Fish Density – fish/m² (Mean Fish Linear Density – fish/m)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------</td>
<td>---------------------------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chinook Salmon</td>
</tr>
<tr>
<td>MWH-030</td>
<td>East Fork SFSR</td>
<td>Upstream of Sugar Creek</td>
<td>2012-2014</td>
<td>97/6.4</td>
<td>0.088 (0.561)</td>
</tr>
<tr>
<td>MWH-022</td>
<td>East Fork SFSR</td>
<td>Upstream of Midnight Creek</td>
<td>2012-2014</td>
<td>80.3/7.8</td>
<td>0.606 (4.707)</td>
</tr>
<tr>
<td>MWH-023</td>
<td>Fiddle Creek</td>
<td>Lower Reach</td>
<td>2012-2014</td>
<td>97/2.0</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-024</td>
<td>Fiddle Creek</td>
<td>Middle Reach</td>
<td>2012</td>
<td>22/2.0</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-011</td>
<td>East Fork SFSR</td>
<td>Near Mining Camp</td>
<td>2012-2015</td>
<td>97.8/5.3</td>
<td>0.397¹ (2.113)</td>
</tr>
<tr>
<td>MWH-013</td>
<td>East Fork SFSR</td>
<td>Near Confluence Meadow Creek</td>
<td>2012-2014</td>
<td>95.7/4.3</td>
<td>0.014 (0.061)</td>
</tr>
<tr>
<td>MWH-025</td>
<td>East Fork SFSR</td>
<td>Middle Reach</td>
<td>2012-2013, 2015</td>
<td>97/4.4</td>
<td>0.020 (0.088)</td>
</tr>
<tr>
<td>MWH-044</td>
<td>East Fork SFSR</td>
<td>Near Worker Housing</td>
<td>2013</td>
<td>100/3.0</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-026</td>
<td>East Fork SFSR</td>
<td>Near Worker Housing</td>
<td>2012-2015</td>
<td>97.8/3.3</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-031</td>
<td>Meadow Creek</td>
<td>Near East Fork SFSR Confluence</td>
<td>2012</td>
<td>91/4.0</td>
<td>1.852¹ (7.407)</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Site ID (Downstream to Upstream)</th>
<th>Stream</th>
<th>Location</th>
<th>Year(s) Sampled</th>
<th>Mean Site Length (m) / Width (m)</th>
<th>Mean Fish Density – fish/m² (Mean Fish Linear Density – fish/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chinook Salmon</td>
</tr>
<tr>
<td>MWH-014</td>
<td>Meadow Creek</td>
<td>Stibnite Mine Site</td>
<td>2013-2015</td>
<td>100/5.1</td>
<td>0.783¹ (4.020)</td>
</tr>
<tr>
<td>MWH-015</td>
<td>Meadow Creek</td>
<td>Downstream of TSF Buttress</td>
<td>2012-2014</td>
<td>97/4.8</td>
<td>0.005 (0.023)</td>
</tr>
<tr>
<td>MWH-047</td>
<td>Meadow Creek</td>
<td>TSF Buttress</td>
<td>2013-2015</td>
<td>100/4.3</td>
<td>0.017 (0.072)</td>
</tr>
<tr>
<td>MWH-016</td>
<td>Meadow Creek</td>
<td>Along the TSF</td>
<td>2012, 2014-2015</td>
<td>97/3.9</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-034</td>
<td>Meadow Creek</td>
<td>Upper Reach</td>
<td>2013, 2015</td>
<td>100/3.2</td>
<td>NP</td>
</tr>
<tr>
<td>MWH-028</td>
<td>EFMC</td>
<td>Near Confluence</td>
<td>2012-2014</td>
<td>97/2.4</td>
<td>2.573¹ (6.175)</td>
</tr>
<tr>
<td>MWH-027</td>
<td>EFMC</td>
<td>In Meadow</td>
<td>2012-2014</td>
<td>97/1.6</td>
<td>NP</td>
</tr>
</tbody>
</table>

Source: MWH 2017

¹ Chinook salmon densities at these locations are higher than would naturally occur, as they were from translocated adults that spawned in a small, localized area.
Site IDs consisted of reaches ranging in length from 22 to 100 meters in length with most reaches set at 100 meters.
Daytime surveys only-all fish size classes combined
EFMC = East Fork Meadow Creek; East Fork SFSR = East Fork South Fork Salmon River; NP – not present.
**Yellow Pine Pit Lake Estimate**

Mark-recapture studies were undertaken at the Yellow Pine pit lake in 2018 and 2019 to evaluate movements of salmonids and to estimate population abundances (Brown and Caldwell 2019b, 2020b). Table 3.12-14 summarizes the abundance estimate results. Detailed discussions are included in Brown and Caldwell (2019b, 2020b). No estimates were made for steelhead due to the low numbers captured (i.e., five in 2018 and nine in 2019). In addition to bull trout, cutthroat trout, Chinook salmon and steelhead/rainbow trout, mountain whitefish were captured, but no abundance estimates were made.

The results indicate limited abundance of these salmonids in the Yellow Pine pit lake. Brown and Caldwell (2019b) notes that several hundred whitefish also were captured suggesting the lake can support a large number of fish given suitable habitat.

**Table 3.12-14 Salmonid Population Abundance Estimates for the Yellow Pine Pit Lake in 2018 and 2019**

<table>
<thead>
<tr>
<th>Species</th>
<th>Abundance Estimate by Month and Year</th>
<th>Source: Brown and Caldwell 2019b and 2020a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>May 2018</td>
<td>July 2018</td>
</tr>
<tr>
<td>Bull Trout</td>
<td>57</td>
<td>104</td>
</tr>
<tr>
<td>Westslope Cutthroat Trout</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Chinook Salmon</td>
<td>No Tagged Juvenile Fish Returned</td>
<td></td>
</tr>
</tbody>
</table>

Four rainbow trout were tagged but the sample size was too small for an abundance estimate.

### 3.12.4.3 Watershed Condition Indicators

This section summarizes the existing data describing the baseline aquatic habitat conditions that may be affected by the SGP within the analysis area. It includes brief descriptions of the streams that may be affected by the SGP both outside and within the mine site. The WCIs are used as a metric to compare baseline conditions to estimated changes that might be caused by projects or other events. Over the past 20 years, various fish and aquatic habitat studies have been conducted in the SFSR subbasin which have provided a better understanding of aquatic resource baseline conditions within the analysis area. Studies have been conducted by federal, state, local, and tribal agencies (e.g., PNF, BNF, IDFG, and the Nez Perce Tribe), as well as private entities (e.g., Perpetua).

**Table 3.12-15** and **Table 3.12-16** summarize the WCI data currently available along with fish species occurrence information for each watershed and subwatershed (Figure 3.12-1). Only one subwatershed (Upper Big Creek) in the Cascade Reservoir Watershed had any WCI data available for the local fish community. More WCI data are available for most of the subwatersheds in the Upper SFSR, Johnson Creek, Lower East Fork SFSR, and Upper East Fork SFSR watersheds.
The Southwest Idaho Ecogroup Matrix of Pathways and WCIs (“The Matrix”) (Forest Service 2003a, 2010a) have been applied to describe and evaluate the baseline environment for fish and aquatic resources in the analysis area. The WCI matrix was developed specifically for application in the PNF and BNF (Forest Service 2003a, 2010a) to assist in project design and analysis during NEPA assessments of proposed projects. The WCI matrix evaluates watershed ecological functions by measuring elements that reflect water quality, habitat access, channel conditions and dynamics, flow and hydrology, and other watershed conditions. Furthermore, the WCI matrix comprises a series of “pathways” by which mining, reclamation, or restoration activities can have potential effects on native and desired non-native fish species, their habitats, and associated ecological functions. This ecological functionality is broken down into three separate categories: “functioning appropriate,” “functioning at risk,” and “functioning at unacceptable risk.” Where possible, quantitative values are applied to determine the functionality. The same description of the pathways and WCIs can be found in Table B-1, Appendix B of each Forest Plan (Forest Service 2003a, 2010a).

**North Fork Payette River Subbasin Baseline**

The Cascade Reservoir Watershed is the only HUC 5th Field watershed in this subbasin (Figure 3.12-1; Table 3.12-15). Eight subwatersheds occur in this watershed that could be impacted by the SGP. Only one subwatershed, Upper Big Creek, has had a WCI analysis completed. Many of the other subwatersheds are on private land and do not have WCIs completed.

**South Fork Salmon River Subbasin Baseline**

Baseline WCI information for the SFSR subbasin for those watersheds and subwatersheds that may be directly impacted by SGP activities is summarized in Table 3.12-16.
### Table 3.12-15 Baseline Watershed Condition Indicators for Potentially Impacted Subwatersheds in the Analysis Area for the Cascade Reservoir and Upper South Fork Salmon River Watersheds

<table>
<thead>
<tr>
<th>Watershed Condition Indicator</th>
<th>Cascade Reservoir Watershed (HUC 5th Field)</th>
<th>Subwatersheds (HUC 6th Field)</th>
<th>Upper SFSR Watershed (HUC 5th Field)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lake Fork</td>
<td>Boulder Creek</td>
<td>Lower Gold Fork River</td>
</tr>
<tr>
<td>Local Population Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Present</td>
<td>Not Present</td>
<td>Not Present</td>
<td>Not Present</td>
</tr>
<tr>
<td>Growth and Survival</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Life History Diversity and Isolation</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Persistence and Genetic Integrity</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature – Bull trout</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Temperature – Other fish species</td>
<td>WSC Not Present</td>
<td>WSC Not Present</td>
<td>WSC Not Present</td>
</tr>
<tr>
<td>Sediment/Turbidity – Steelhead, Chinook salmon</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Sediment/Turbidity – Bull trout</td>
<td>N/A</td>
<td>N/A</td>
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**Watershed Conditions**

- **Road Density/Location**: No Data
- **Disturbance History**: No Data
- **Riparian Conservation Areas**: No Data
- **Disturbance Regime**: No Data

**Integration of Pathways**

- **Integration of Pathways (Steelhead, Chinook salmon)**: N/A
- **Integration of Pathways (Bull trout)**: N/A
- **Integration of Pathways (Other fish species, i.e., westslope cutthroat trout)**: No Data


Subwatersheds are at the HUC 6th Field.

FA = Functioning Appropriately; FR = Functioning at Risk; FUR = Functioning at Unacceptable Risk; N/A = Not Applicable; WSC = westslope cutthroat trout
### Table 3.12-16 Baseline Watershed Condition Indicators for Potentially Impacted HUC 6th Field Subwatersheds in the Analysis Area

<table>
<thead>
<tr>
<th>Watershed Condition Indicator</th>
<th>Johnson Creek Watershed (HUC 5th Field)</th>
<th>East Fork SFSR Watershed (HUC 5th Field)</th>
<th>Upper East Fork SFSR Watershed Outside of the Mine Site</th>
<th>Upper East Fork SFSR Watershed Within the Mine Site</th>
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<tbody>
<tr>
<td></td>
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<td>Headwaters Johnson Creek</td>
<td>Sheep Creek</td>
<td>Burnt Log Creek</td>
</tr>
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<td>Dutch/Ditch Creek</td>
<td>Trapper Creek</td>
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<td>Riordan Creek</td>
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<td>Porcupine Creek</td>
<td>Lower East Fork SFSR</td>
<td>Quartz Creek</td>
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<td></td>
<td></td>
<td></td>
<td>Sugar Creek</td>
<td>Headwaters East Fork SFSR</td>
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#### Bull Trout Local Population Characteristics within Core Area

- **Local Population Size**
  - FUR FUR FUR FA Bull Trout Present No Data
  - FA No Data
  - No Data No Data No Data No Data No Data No Data No Data No Data

- **Growth and Survival**
  - FUR FR FR FR FR No Data
  - FA No Data
  - No Data No Data No Data No Data No Data No Data No Data No Data

- **Life History Diversity and Isolation**
  - FUR FR FR FR FR No Data
  - FA No Data
  - No Data No Data No Data No Data No Data No Data No Data No Data

- **Persistence and Genetic Integrity**
  - FUR FR FR FR FR No Data
  - FA No Data
  - No Data No Data No Data No Data No Data No Data No Data No Data

#### Water Quality

- **Temperature (Steelhead, Chinook salmon)**
  - FUR FUR FUR FR Steelhead Present No Data
  - FA No Data
  - FUR No Data
  - FR No Data

- **Temperature (Bull trout)**
  - FUR FUR FUR FR No Data
  - FA No Data
  - FUR No Data
  - FR No Data

- **Temperature (Other fish species, i.e., westslope cutthroat trout)**
  - No WSC No Data for other species
  - FUR WSC Present No Data
  - FUR No Data
  - No Data No Data No Data No Data No Data No Data No Data No Data

- **Sediment/Turbidity (Steelhead, Chinook salmon)**
  - FUR FUR FA FA Steelhead Present No Data
  - FA No Data
  - FUR No Data
  - FR N/A No Data

- **Sediment/Turbidity (Bull trout)**
  - FUR FUR FA FA No Data
  - FA No Data
  - FUR No Data
  - FR No Data

- **Chemical Contaminants/Nutrients**
  - No Data
  - No Data
  - No Data
  - FA No Data
  - No Data
  - No Data
  - FUR No Data
  - No Data
  - No Data

#### Habitat Access

- **Physical Barriers**
  - FUR FA FUR FA No Data
  - FUR No Data
  - FA FUR FR No Data

#### Habitat Elements

- **Substrate Embeddedness (Bull trout rearing areas)**
  - FUR FUR FA FA No Data
  - FA No Data
  - FUR FR FR FR No Data

- **Large Woody Debris**
  - FA FA FA FA No Data
  - FA No Data
  - FA FUR FUR No Data

- **Pool Frequency and Quality**
  - FA FA FA FA No Data
  - FA No Data
  - FA FUR No Data

---

Stibnite Gold Project Supplemental Draft Environmental Impact Statement

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### Watershed Condition

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<thead>
<tr>
<th>Indicator</th>
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<th>Riordan Creek</th>
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<th>East Fork SFSR Watershed (HUC 5th Field)</th>
<th>Upper East Fork SFSR Watershed (HUC 5th Field) Outside of the Mine Site</th>
<th>Upper East Fork SFSR Watershed (HUC 5th Field) Within the Mine Site</th>
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<tbody>
<tr>
<td>Large Pools/Pool Quality (all fish species in adult holding, juvenile rearing, and over wintering reaches)</td>
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### Watershed Conditions

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### Integration of Pathways

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<td>Integration of Pathways (Steelhead, Chinook salmon)</td>
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Source: Forest Service 2010e; Johnson Creek Watershed Improvement Project-Boise NF: Attachment B, Subwatersheds Baselines; Forest Service 2012a; Foust and Nalder 2010; Rio ASE 2019; StreamNet 2020

WCI thresholds used are from Rio ASE 2019.

FA = Functioning Appropriately; FR = Functioning at Risk; FUR = Functioning at Unacceptable Risk; WSC = westslope cutthroat trout
East Fork South Fork Salmon River Watershed Baseline

The East Fork SFSR watershed covers approximately 250,000 acres and enters the mainstem SFSR near the confluence of the Secesh River. Most of the watershed is administered by the Forest Service and managed by the PNF and BNF. Private land in the watershed includes small parcels of land along Johnson Creek, large legacy mines in the headwater drainages (e.g., Stibnite and Cinnabar mines), and the village of Yellow Pine. Predominant historical land uses occurring in this watershed include timber harvest and large-scale mining (Wagoner and Burns 2001 in NMFS 2016). Extensive cattle grazing also historically occurred in the Johnson Creek watershed, but federal grazing allotments have now been retired and grazing has been reduced to private lands.

Large-scale legacy mining altered stream channel conditions in the Upper East Fork SFSR watershed. The Forest Service and mine operators have since undertaken restoration work. However, habitat for migratory salmonids in the East Fork SFSR upstream of the Yellow Pine pit lake is inaccessible because legacy mining excavation of the stream channel has created a gradient barrier (Yellow Pine pit lake cascade). Although there has been a reduction in human influences since about 1950, there are still significant legacy effects that continue to impact channel conditions and fish populations. Kuzis (1997) describes the Upper East Fork SFSR watershed as follows:

“The most significant geophysical processes affecting channels in the East Fork SFSR are mass wasting and erosion. The most obvious impacts to stream channels are located at the Yellow Pine pit lake, Meadow Creek, East Fork Meadow Creek, and the Cinnabar Mine area.”

The East Fork SFSR drainage has the lowest quality habitat for sensitive and protected fish in the SFSR subbasin (Northwest Power Conservation Council 2004). Primary habitat limitations in the East Fork SFSR drainage are reduced riparian habitat and decreased streambank stability due both to road design and the extent of the existing road system; secondary limitations include reduced instream large woody debris, water quality degradation, and fish passage barriers resulting from legacy mining in the area (Northwest Power Conservation Council 2004).

All IDEQ-inventoried waterbodies at the proposed mine site (except for West End Creek) are listed under Section 303(d) of the federal CWA as “impaired” due to water quality. The causes for listing of these waters are associated with elevated concentrations of arsenic, antimony, and mercury. Each of the 303(d)-listed waterbodies has designated beneficial uses of “cold water communities,” “salmonid spawning,” and “primary contact recreation,” and all (except Sugar Creek) have designated beneficial uses of “drinking water supply.”

Wildfires have eliminated much of the tree canopy at the SGP mine site and vicinity and substantial erosion occurs (HDR 2013). In addition, the failure of a dam on the EFMC (also referred to as Blowout Creek) in 1965 resulted in extensive erosion, both upstream and downstream from the former dam and reservoir site, which in turn has led to extensive and ongoing deposition of sediment in the lower reaches of Meadow Creek and downstream in the East Fork SFSR. Currently, while concentrations of total suspended solids and turbidity are low during some months, there is seasonal variation in these concentrations associated with high flow periods when concentrations can reach moderate to high levels.
East Fork South Fork Salmon River

The East Fork SFSR is a tributary to the SFSR. The East Fork SFSR between its confluence with Sugar Creek upstream to the Yellow Pine pit lake is 1.2 km, upstream to the confluence with Meadow Creek is 6.1 km. This stream reach includes the Yellow Pine pit lake, immediately upstream of which is a long cascade (22 percent gradient) that presents a complete upstream passage barrier for all fish species including migrating Chinook salmon and steelhead. Despite the migratory barrier at the Yellow Pine pit lake, bull trout and westslope cutthroat trout are known to occur upstream of the Yellow Pine pit lake. Chinook salmon also spawn and rear in the stream reach upstream of the lake because they have been introduced there by the IDFG. Downstream of the Yellow Pine pit lake, this stream reach is accessible to all four special status salmonid species.

Between Meadow Creek and the Yellow Pine pit lake, the East Fork SFSR widens and has larger streambed material (including abundant cobble and boulders), relative to the upper East Fork SFSR. This stream reach has moderate to high stream gradients (approximately 2 to 8 percent) (HDR 2016c). Moving downstream to the confluence with Sugar Creek, the East Fork SFSR is similar in width, gradient, and substrate material as upstream, but many of the larger boulders and cobble are sharp and more angular. Based on field surveys conducted by Rio ASE (2019), there are more and deeper pools upstream of the Yellow Pine pit lake. The East Fork SFSR generally supports a healthy riparian corridor, with the exception of areas near the Yellow Pine pit lake and areas of legacy mine waste dumps along the banks upstream and downstream of the Yellow Pine pit lake.

The East Fork SFSR in this reach has been heavily impacted by legacy mining activities. In addition to the Yellow Pine pit lake, a remnant of legacy mining activities, these impacts include waste rock dumps in and adjacent to the stream channel, tailings washed down from Meadow Creek valley, roads and infrastructure within and adjacent to the East Fork SFSR channel, dam construction across the East Fork SFSR main channel, and other legacy impacts (Midas Gold 2016a).

Hennessy Creek

Hennessy Creek historically flowed into the East Fork SFSR downstream of the Yellow Pine pit lake, but it has been diverted to flow into the East Fork SFSR downstream of Sugar Creek. It is a narrow, low-flow stream that flows in a constructed ditch alongside McCall-Stibnite Road (CR 50-412), and then through a subterranean section under an adjacent waste rock dump before passing through a very high-gradient reach into the East Fork SFSR. The creek is not expected to support upstream fish passage because of an average channel gradient of 37 percent at its mouth (HDR 2016c). Hennessy Creek is densely vegetated and shallow. The lower portion of Hennessy Creek has been significantly impacted by legacy mine-related activities, including stream diversion, road construction that buried the stream channel, and mining infrastructure (Midas Gold 2016a).

Yellow Pine Pit Lake

During mining activities during the 1930s through the 1950s, the nearly 5-acre Yellow Pine pit lake was created by open pit mining while the East Fork SFSR was diverted through the Bradley Tunnel to Sugar Creek (Hogen 2002). After mining ceased in 1952, the East Fork SFSR was allowed to flow through the abandoned mine pit. The pit currently has a maximum depth of approximately 11 meters. Diverting the
East Fork SFSR back into the stream channel and pit created a long cascade with a high (22 percent) gradient that precluded fish passage upstream into the upper watershed. Therefore, all streams upstream of the Yellow Pine pit lake are inaccessible to anadromous Chinook salmon and steelhead without human intervention. The Yellow Pine pit lake is used by both fish and mammals, including Chinook salmon, bull trout, and river otters. Mountain whitefish are abundant in the lake (Brown and Caldwell 2019b and 2020b) and it supports a healthy benthic macroinvertebrate community (IDEQ 2002). Bull trout found in the Yellow Pine pit lake may be either resident (Brown and Caldwell 2020b) and/or an adfluvial life history population that use the Yellow Pine pit lake for overwintering, with downstream migration to tributaries for spawning (Hogen and Scarnecchia 2006).

The Yellow Pine pit lake is the largest feature that affects flow rates in the East Fork SFSR; however, because of its small area, it affects low flows only slightly and does not affect high flows at all (Kuzis 1997). The lake also displays thermal stratification (i.e., order), but resuspension of sediments due to turnover is not expected. The bottom velocities necessary for turnover would not be high enough for resuspension (IDEQ 2002). Fish sampling in the Yellow Pine pit lake was not included in the habitat-related aquatic baseline studies conducted by HDR (2016c) or MWH (2017).

**Midnight Creek**

Midnight Creek is a small tributary of the East Fork SFSR. The lower portion of the creek is characterized as a narrow channel with extremely high gradient (approximately 90 percent) and dense overhanging vegetation. The high gradient presents a complete fish passage barrier to fish (HDR 2016c). Midnight Creek has been impacted by legacy mining activities, including open-pit mining, waste rock dumps, and road construction (Midas Gold 2016a).

Midnight Creek was not included in the preliminary baseline study due to restricted access, but it was surveyed by Great Ecology (2018) in the supplemental assessment. There is no baseline fish use noted for Midnight Creek (MWH 2017).

**Fiddle Creek**

Fiddle Creek is a small tributary of the East Fork SFSR just upstream of Midnight Creek. Habitat conditions in the creek have been adversely impacted from legacy mine operations, road construction, and culvert installation (Midas Gold 2016a). The lower portion of Fiddle Creek also was the site of a former water storage reservoir, the construction and operation of which degraded portions of the stream.

The lower reach of Fiddle Creek has an approximate 37 percent gradient where it flows into the East Fork SFSR, creating a complete barrier to upstream fish passage (HDR 2016c). Upstream of this barrier, Fiddle Creek retains a relatively high gradient in a relatively narrow channel, with side channels (HDR 2016c). The lower portion of the creek has a thick tall-shrub overstory dominated by gray alder (Alnus incana) (HDR 2016c). The uppermost section of Fiddle Creek is natural glacial topography, flattens in gradient, and is a slower meandering stream. Large amounts of large woody debris occur throughout the creek, and the dominant streambed substrate consists of boulders, large cobble, and gravel (HDR 2016c). Westslope cutthroat trout were the only salmonids observed in Fiddle Creek or detected in eDNA surveys (MWH 2017).
**Garnet Creek**

Garnet Creek is a narrow, shallow, moderate-gradient tributary to East Fork SFSR approximately 0.5 km downstream from the Meadow Creek confluence. The creek has been severely modified over the past 100 years to accommodate mining-related activities. It is still influenced by legacy mining infrastructure that was located across and adjacent to the stream channel, including portions of a town site; and is currently routed through several man-made ditches (Midas Gold 2016a). Garnet Creek flows through a 26-m-long corrugated metal pipe culvert near its confluence with the East Fork SFSR that presents a partial barrier to fish (HDR 2016c).

Garnet Creek was surveyed by Great Ecology (2018) in a supplemental assessment. Garnet Creek cuts through a formerly burned hillside. Most of the vegetative cover along the creek is composed of grasses; however, shrubs and trees grow alongside its banks, and woody vegetation is found in the channel (MWH 2017). There is no baseline fish use noted for Garnet Creek (MWH 2017).

**Lower and Middle Meadow Creek**

Meadow Creek is a major tributary to the East Fork SFSR that flows through a flat-bottomed valley surrounded by steep mountains. Elevations range from 1.9 km above sea level in the lower reach to over 2.3 km in the headwaters. Meadow Creek has been heavily impacted by legacy mining-related activities, including deposition of tailings and spent heap leach ore, ore processing facilities, heap leach pads, and other infrastructure, stream relocation into a straightened riprap channel, and construction of an airstrip (Midas Gold 2016a). The downstream end of the valley shows remnant effects from early mining activities, along with a large outwash feature created by a dam failure in the EFMC drainage south of the site of the Meadow Creek Mine. Portions of the creek have been modified over the years to improve conditions caused by past mine operations, including the regrading and revegetation of the 2 percent gradient lower reach of the creek in 2004 and 2005.

The middle reach of Meadow Creek is an engineered channel that was constructed to bypass the SODA. The channel was lined with riprap over geotextile fabric and is confined between reinforced/engineered slopes with a gradient of less than 2 percent. This reach has a short section with a 9 percent gradient, shallow depths, and few pools, which may be a partial fish migration barrier at low flows. The channel includes low-gradient riffles, glides (section of the stream coming out of a pool) and runs. There is no side channel development or potential large woody debris recruitment.

**Upper Meadow Creek**

Upper Meadow Creek encompasses the headwaters downstream to the location of proposed TSF Buttress. Upper Meadow Creek is confined and high gradient at the most upstream extent and low gradient and unconfined immediately upstream of the SODA in lower Meadow Creek, transitioning from a gradient of 4 to 8 percent to 2 to 4 percent. Habitat is composed of riffles, step runs (sequence of runs separated by shorter riffle steps), and pools. The presence of side channels in some portions provide potential for lateral channel movement in the less confined sections. Immediately upstream of the SODA, Meadow Creek is unconfined, with a gradient less than 1 percent. The reach is composed of low-gradient riffle, step run, and pool habitat. The floodplain is active with oxbow cutoffs, side channels, and backwater features.
**East Fork Meadow Creek**

The EFMC, also known as “Blowout Creek,” is a tributary to Meadow Creek that has been severely impacted as a result of legacy mining-related activities and the failure of a dam that had been constructed across its stream channel (Midas Gold 2016a). The dam was constructed in 1929 to supply hydroelectric power for historical milling operations. The dam failed in 1965 due to record snow melt and runoff rates, depositing large volumes of sediment into Meadow Creek, the East Fork SFSR, and the Yellow Pine pit lake (URS 2000b in MWH 2017). This stream is considered to be the largest source of sediment to the East Fork SFSR in the analysis area.

The middle reach of EFMC flows through a lateral glacial moraine that eroded during the dam failure and is still considered unstable as it continues to deposit sediments into Meadow Creek and the East Fork SFSR. Upstream of this middle reach, EFMC has a low-gradient pool-riffle reach flowing through a large meadow. This reach is incised and continues to headcut in response to the dam failure. There are few trees and the banks have abundant grasses. The dominant streambed material is sand and gravel (MWH 2017). The EFMC headwaters are high gradient (4 to 20 percent) with cascades, high-gradient riffle, and plunge-pool habitat.

Immediately downstream of the historical dam location, the creek has a slightly steeper (8 to 20 percent) gradient and is composed of cascade habitat. Near the confluence with Meadow Creek, the EFMC passes through a multi-thread and unconfined alluvial fan with a 4 to 8 percent gradient. Sediment from the unstable slopes immediately upstream may contribute to the formation and maintenance of this alluvial fan.

**Headwaters East Fork SFSR**

Upstream of the Meadow Creek confluence, the East Fork SFSR is characterized by narrower channels with moderate gradient (2 to 4 percent), transitioning to higher-gradient (4 to 8 percent) step-pool habitat further upstream. Overall substrate size is generally smaller than downstream reaches, with sand, gravel, smaller cobble, and boulders. This reach of the East Fork SFSR has relatively abundant riparian vegetation and large amounts of large woody debris.

Kuzis (1997) found that the Headwaters East Fork SFSR displays evidence of a high sediment load, such as streambed aggradation (deposition of material), channel splitting, pool filling, and overbank deposits of fines. The combination of low-gradient, relatively wide valley, plentiful wood supply, and a high sediment supply have resulted in current channel conditions.

**East Fork SFSR Between Sugar Creek and Profile Creek**

The East Fork SFSR downstream from Sugar Creek is adjacent to the SGP mine site in the No Mans-East Fork SFSR subwatershed. The East Fork SFSR ranges from low-gradient habitat with pools to high gradient habitat with cascades. Substrate throughout the reach is variable, and dependent on the gradient, with the lower-gradient sections dominated by gravel and cobbles, while the higher-gradient units are dominated by large cobble and boulders. Avalanches in 2014 have resulted in high concentrations of large woody debris in the East Fork SFSR downstream from Sugar Creek (MWH 2017). In April 2019, a series of avalanches and related landslides caused extensive damage to Stibnite Road (CR 50-412), and pushed
snow, timber, and other debris into the East Fork SFSR (Midas Gold 2019a). These events were naturally occurring in burn areas and were related to rain-on-snow events.

Sugar Creek

Sugar Creek, a tributary to the East Fork SFSR, enters the river downstream of the Yellow Pine pit lake. It has a relatively low gradient. An officially closed road closely parallels Sugar Creek for nearly 3.2 km. This road may confine the movement of Sugar Creek, specifically in areas where the banks are bound with riprap rock material. Much of Sugar Creek has large aggregates of large woody debris. The dominant substrates are sand, gravel, and cobble.

This creek has widened channels, and excessive medial and lateral bar formation in response to past sediment inputs. In the 1940s, approximately 1 million cubic yards (approximately 76,455 cubic meters) of glacial overburden was removed from the East Fork SFSR channel and placed in both Sugar Creek and other parts of the East Fork SFSR (Kuzis 1997).

Sugar Creek supports spawning and rearing for all four salmonid species and represents one of the most productive fish habitats in the Upper East Fork SFSR watershed. Legacy mining-related impacts include construction of an access road adjacent to and in the stream channel, upstream sources of sediment, and mercury contamination.

Mine Site Watershed Condition Indicators

Baseline WCIs were determined for the stream reaches within the SGP mine site. Of the WCIs listed in Table 3.12-17, not all are equal in terms of evaluating the potential impacts of the SGP within the mine site. Some baseline WCIs are of historical interest, some would not be affected by the SGP, some are not well-established from a quantitative analysis perspective so they cannot be evaluated, and some WCIs are irrelevant to the SGP. For these reasons, five WCIs that have the greatest potential to accurately identify potential impacts due to the SGP were selected for detailed analysis including Water Temperature; Sediment/Turbidity; Chemical Contaminants; Physical Barriers; and Change in Peak/Base Flows. A description of each of these WCIs and their current condition is provided in Table 3.12-17.

Water Temperature

Baseline water temperatures for the SGP mine area were evaluated using a SPLNT model developed by Brown and Caldwell (2021a). This model evaluated stream water temperatures and Yellow Pine pit lake water temperatures under baseline conditions and then potential changes that may occur as a result of proposed mine operations and subsequent reclamation. See Section 4.9.2.3 for further details on the models.

Results of the SPLNT model describing existing conditions (maximum weekly summer (July) and fall (September) temperatures) are shown in Table 3.12-18.
### Table 3.12-17 Mine Site Stream Reaches Baseline Summary of Watershed Condition Indicators

<table>
<thead>
<tr>
<th>Watershed Condition Indicator</th>
<th>East Fork SFSR and Tributaries from Sugar Creek to Meadow Creek</th>
<th>Meadow Creek and EFMC</th>
<th>East Fork SFSR Upstream from Meadow Creek</th>
<th>East Fork SFSR Between Sugar Creek and Profile Creek</th>
<th>Sugar Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bull Trout Local Population Characteristics within Core Area</strong></td>
<td></td>
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<tr>
<td>Local Population Size</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
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<tr>
<td>Growth and Survival</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
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<tr>
<td>Diversity and Isolation</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
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<tr>
<td>Persistence and Genetic Integrity</td>
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<tr>
<td><strong>Water Quality</strong></td>
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<tr>
<td>Temperature (Steelhead/Chinook salmon)</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
</tr>
<tr>
<td>Temperature (Bull trout)</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
<td>FR</td>
</tr>
<tr>
<td>Sediment/Turbidity (Steelhead, Chinook salmon)</td>
<td>FUR</td>
<td>FUR</td>
<td>FUR</td>
<td>FUR</td>
<td>FUR</td>
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<tr>
<td>Sediment/Turbidity (Bull trout)</td>
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<td>FUR</td>
<td>FUR</td>
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<td>Chemical Contaminants</td>
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<td>Physical Barriers</td>
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<td>FUR</td>
<td>FA</td>
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<td>Substrate Embeddedness (Bull trout rearing areas)</td>
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<td>Large Woody Debris</td>
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<td>Pool Frequency and Quality</td>
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<tr>
<td>Refugia (Steelhead/Chinook salmon)</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
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<tr>
<td>Refugia (bull trout)</td>
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<td>FR</td>
<td>FR</td>
<td>FR</td>
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<tr>
<td>Watershed Condition Indicator</td>
<td>East Fork SFSR and Tributaries from Sugar Creek to Meadow Creek</td>
<td>Meadow Creek and EFMC</td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>East Fork SFSR Between Sugar Creek and Profile Creek</td>
<td>Sugar Creek</td>
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<tr>
<td>Channel Conditions and Dynamics</td>
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<td>Average Wetted Width/Maximum Depth Ratio</td>
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<td>Flow/Hydrology</td>
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<td>Change in Peak/Base Flows</td>
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<tr>
<td>Change in Drainage Network</td>
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<tr>
<td>Watershed Condition</td>
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<tr>
<td>Road Density/Location</td>
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<td>Integration of Pathways</td>
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<tr>
<td>Integration of Species/Habitat Conditions</td>
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<td>FR</td>
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<td>FR</td>
</tr>
</tbody>
</table>

Source: Rio ASE 2019a, Forest Service 2010e; IDEQ 2017b; Burns et al. 2005; Kuzis 1997, MWH 2017; USFWS 2015a, and Integration of Species and Habitat which is derived from professional judgment.

FA = functioning appropriately; FR = functioning at risk; FUR = functioning at unacceptable risk.
Table 3.12-18 SPLNT Modeled Baseline Maximum Weekly Summer and Fall Stream Temperatures for Specific Stream Reaches

<table>
<thead>
<tr>
<th>SPLNT Model Stream Reaches</th>
<th>Baseline Summer Daily Maximum Temperatures (°C)</th>
<th>Baseline Fall Daily Maximum Temperatures (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper East Fork SFSR (upstream of Meadow Creek confluence)</td>
<td>13.4</td>
<td>11.0</td>
</tr>
<tr>
<td>Meadow Creek upstream of EFMC confluence</td>
<td>14.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Meadow Creek downstream of EFMC confluence</td>
<td>19.4</td>
<td>15.9</td>
</tr>
<tr>
<td>Middle East Fork SFSR (between Meadow Creek and YPP)</td>
<td>17.3</td>
<td>13.9</td>
</tr>
<tr>
<td>Lower East Fork SFSR (between YPP and Sugar Creek)</td>
<td>14.1</td>
<td>11.2</td>
</tr>
<tr>
<td>East Fork SFSR downstream of Sugar Creek confluence</td>
<td>14.9</td>
<td>11.9</td>
</tr>
</tbody>
</table>

East Fork SFSR = East Fork South Fork Salmon River; YPP = Yellow Pine pit lake barrier; EFMC = East Fork Meadow Creek

Establishing existing surface water temperature conditions at the SGP mine site was performed as part of the Surface Water Quality Baseline Study (HDR 2017f) to provide a baseline dataset for comparing future temperature changes predicted by the SPLNT model.

The SPLNT model did not account for changes to stream temperatures caused by changing climate conditions. This means the model assumed future stream temperatures would be similar to the historic water temperature data without the SGP (Brown and Caldwell 2021i). Given ongoing climate changes, modeled temperature results would likely be higher if climate change had been considered in the model. The effects of different air temperature conditions on stream temperatures were evaluated through a sensitivity analysis (Brown and Caldwell 2018a) and an uncertainty analysis (Forest Service 2022b).

The NorWeST model, produced by the Forest Service Rocky Mountain Research Station, provides a variety of scenario-based parameters that represent future stream temperatures for National Hydrography Dataset (-Plus) reaches across the western U.S. NorWeST-modeled stream temperatures are presented (Isaak et al. 2016) alongside the SPLNT stream temperatures in Table 3.12-19 and ESS 2019a to provide information regarding the possibility of changing climate conditions in the analysis area.

Table 3.12-19 Comparison of Baseline SPLNT Model Temperatures with NorWeST Model Stream Temperatures for Multiple Timeframes (Mean August Temperatures)

<table>
<thead>
<tr>
<th>SPLNT Reach</th>
<th>Baseline SPLNT Modeled Stream Temperature (°C)</th>
<th>NorWeST Model Stream Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1930-2011</td>
</tr>
<tr>
<td>YPP Lake Headwater</td>
<td>11.9</td>
<td>11.57</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>11.8</td>
<td>10.38</td>
</tr>
<tr>
<td>Upper East Fork SFSR at Rabbit Creek</td>
<td>9.5</td>
<td>9.95</td>
</tr>
<tr>
<td>Sugar Creek</td>
<td>9.2</td>
<td>10.83</td>
</tr>
</tbody>
</table>

°C = degrees Celsius; SPLNT = Stream and Pit Lake Network Temperature
Of the NorWeST parameters, modeled stream temperatures for 1993-2011 and 2015 are the most appropriate for comparison to existing condition (baseline) SPLNT modeled stream temperatures because they most closely coincide with the data that was used to represent baseline conditions. The NorWeST data from the above timeframes most closely coincides with the baseline data, which was collected between 2012 and 2019. There are two parameters within the NorWeST dataset that predict stream temperatures based on future scenarios; they are represented by warming trajectories 2040 (2030-2059) and 2080 (2070-2099). The exact year when the SGP would be implemented is unknown; however, if construction were to begin in 2022, then Mine Year 20 would occur in 2045 (3 years construction plus 20 years of operation and closure and reclamation activities), within the NorWeSt 2040 (2030-2059) prediction timeframe. Year 112 would be outside of the predicted timeframes the NorWeSt models provide, but the predictions through 2099 are representative of the modeled long-term trend applicable to that time period. These factors were considered when interpreting modeled future temperatures, especially the further into the future the modeled water temperatures represent.

These modeling results indicate that, depending on stream reach, climate change would increase water temperatures from baseline estimates to the end of the mine operations (2030-2059) by as much as 0.1° to 2.0°C. Into the future, baseline estimates for water temperatures would increase by as much as an additional degree (2070-2099). Depending on the salmonid species, climate change may have important biological impacts that were not considered in the SPLNT modeling. The WCI criteria for water temperatures are species and life-stage-dependent (Rio ASE 2019a). The criteria also are defined as the 7-day average daily maximum water temperatures (MWMT). The WCI water temperature criteria for Chinook salmon and steelhead spawning and rearing, and bull trout spawning, incubation, and rearing, used in the WCI functional assessment are included in BioAnalysts (2019; as cited in Rio ASE 2019) and Forest Service (2003a).

**Sediment/Turbidity**

All of the stream reaches in the Headwaters East Fork SFSR subwatershed are at unacceptable risk for Chinook salmon, steelhead, and bull trout due to baseline sediment conditions (Table 3.12-17). This is due to a variety of past disturbances at the SGP mine site that are currently affecting streambank stability and erosion, and the proximity to existing roads. The matrix WCIs use surface fines as a proxy to evaluate suspended sediment, turbidity, and salmonid spawning substrate quality.

**Chemical Contaminants**

This WCI is used to evaluate chemical contamination in surface waters in the analysis area at the mine site. The description of existing conditions relies upon data collected at eight surface water chemistry monitoring locations (Figure 3.9-7) and from information provided in Section 3.9 Water Quality.

The description of chemical contaminants focuses on five constituents of concern: aluminum, copper, antimony, arsenic, and mercury. These five constituents of concern were selected because certain concentrations within the water or fish tissue can be detrimental to fish (potential effects to fish described in more detail below). Table 3.12-20 provides the baseline conditions for these constituents of concern compared to the applicable criteria. Criteria were chosen based on consultation with the USFWS and NMFS. Explanations of the analysis criteria for the five constituents are provided in Table 3.12-20 notes.
The chemical contaminants WCI, the analysis area is “functioning at risk or unacceptable risk” (Table 3.12-17) due to existing levels of legacy mining contamination. No stream on the SGP mine site is considered within acceptable risk levels for chemical contaminants. The constituents that are currently exceeding thresholds are arsenic, antimony, copper, and mercury.

### Table 3.12-20 Average Measured Constituent Concentrations at Monitoring Locations

<table>
<thead>
<tr>
<th>Constituent of Concern</th>
<th>Aluminum(^1)</th>
<th>Copper(^2)</th>
<th>Antimony(^3)</th>
<th>Arsenic(^4)</th>
<th>Mercury(^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis Criteria</strong></td>
<td>0.38 mg/L</td>
<td>0.0024 mg/L</td>
<td>0.0056 mg/L</td>
<td>0.010 mg/L</td>
<td>2.0E-06 mg/L</td>
</tr>
<tr>
<td><strong>Node</strong></td>
<td><strong>Stream</strong></td>
<td><strong>Average Measured Baseline (mg/L)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>0.012</td>
<td>0.0003</td>
<td>0.0061</td>
<td>0.035</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>0.012</td>
<td>0.0003</td>
<td>0.0081</td>
<td>0.034</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>0.0094</td>
<td>0.0002</td>
<td>0.012</td>
<td>0.025</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>0.0094</td>
<td>0.0003</td>
<td>0.017</td>
<td>0.028</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>0.0098</td>
<td>0.0002</td>
<td>0.019</td>
<td>0.031</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>0.012</td>
<td>0.0003</td>
<td>0.031</td>
<td>0.063</td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>0.014</td>
<td>0.0002</td>
<td>0.022</td>
<td>0.045</td>
</tr>
<tr>
<td>YP-T-11</td>
<td>Fiddle Creek</td>
<td>0.016</td>
<td>0.0002</td>
<td>0.0006</td>
<td>0.002</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>0.004</td>
<td>0.0003</td>
<td>0.0105</td>
<td>0.08</td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>0.009</td>
<td>0.00856(^6)</td>
<td>0.034</td>
<td>0.013</td>
</tr>
</tbody>
</table>

Source: Midas Gold 2019c; SRK 2021b

Analysis criteria pertain to fish species. Aluminum, arsenic, and mercury criteria are based on total concentrations while copper and antimony are based on dissolved concentrations.

1. Aluminum: Lowest predicted for the SGP area based on Recommended Aquatic Life Criteria (EPA 2018g); The same water quality data as in the Biotic Ligand Model were used (Brown and Caldwell 2020c).

2. Copper criteria was derived using the Biotic Ligand Model per guidance contained in IDEQ (2017b). A conservative chronic copper standard was estimated by applying the lowest of the 10\(^{th}\) percentile chronic criteria based on regional classifications for the Salmon River Basin, Idaho Batholith, and third order streams. Per the SGP Water Quality Management Plan (Brown and Caldwell 2020a), preliminary calculations using the Biotic Ligand Model and site-specific data have produced similar values to the standard derived using these regional classifications.

3. Antimony does not have a specified NMFS or USFWS criteria and is based on EPA’s human health chronic criterion for consumption of water and organisms is 0.0056 mg/L.

4. Arsenic: NMFS (2014) directed EPA to promulgate or approve a new aquatic life criterion. In the interim, NMFS directed EPA to ensure the 0.010 mg/L human health criterion applied in all NPDES permits. USFWS (2015b) directed EPA to ensure that the 10 μg/L recreational use standard is applied in all Water Quality Based Effluent Limitations (WQBELs) and Reasonable Potential to Exceed Calculations using the human health criteria and the current methodology for developing WQBELs to protect human health.

5. Mercury: NMFS (2014) directed EPA to promulgate or approve a new criterion. In the interim, implement the fish tissue criterion that IDEQ adopted in 2005. Where fish tissue is not readily available, then NMFS specified application of a 2.0E-06 mg/L threshold (as total mercury) in the interim. USFWS (2015b) directed EPA to use the 2001 EPA/2005 Idaho human health fish tissue criterion of 0.3 mg/kg wet weight for WQBELs and reasonable potential to exceed criterion calculations using the current methodology for developing WQBELs to protect human health.

6. Of the 38 dissolved copper values reported for YP-T-1, only one value was higher than 0.00261 mg/L; therefore, it is likely that this single anomalous value was the result of a sampling, analytical, or data management error.

mg/L = milligrams per liter
**Aluminum**

Aluminum can accumulate at the surface of the gill, leading to respiratory dysfunction and disruption of salt balance, and can cause mortality (EPA 2018g). The aquatic life recommended criteria for aluminum for a site are based on site-specific conditions of pH, total hardness, and dissolved organic carbon. The EPA acute criteria for the same conditions as used in calculating the site-specific copper criteria based on the Biotic Ligand Model (Brown and Caldwell 2020b), range from 930 to 2,500 μg/L total recoverable aluminum, and the chronic criteria range from 360 to 1,700 μg/L total recoverable aluminum. The State of Idaho does not currently have a specific water quality standard for aluminum in place for the protection of aquatic life and the EPA criteria have not yet been adopted by the State of Idaho. Nevertheless, they reflect the most current knowledge of potential impacts of aluminum to aquatic life. None of the assessment nodes show an exceedance of the analysis criteria for aluminum.

**Copper**

Copper and copper compounds are acutely toxic to fish and other aquatic life at low parts per billion levels (Eisler 1991, 2000; Hamilton and Buhl 1990). Copper is essential to the growth and metabolism of fish and other aquatic life, but it can cause irreversible harm at levels slightly higher than those required for growth and reproduction (Eisler 2000). Exposure to sublethal levels of copper can have a detrimental effect on the behavior of salmonids. McIntyre et al. (2012) evaluated the effects of copper exposure on juvenile Coho salmon (*Oncorhynchus kisutch*) predator avoidance behaviors and found that the exposed juveniles were unresponsive to their chemosensory environment, unprepared to evade nearby predators, and less likely to survive an attack sequence. Salmonids are known to avoid waters with sublethal concentrations of copper, and such concentrations alter other behavior as well.

The Biotic Ligand Model-based copper criteria indicated an exceedance in Sugar Creek at YP-T-1. However, of the 38 dissolved copper values reported for YP-T-1, only one value was higher than 0.00261 mg/L; therefore, it is likely that this single anomalous value was the result of a sampling, analytical, or data management error.

**Antimony**

Known effects of antimony on aquatic organisms are more limited than for other metals and most available information pre-date the last three decades. Antimony can be toxic to aquatic life and bioaccumulate in tissues but has not consistently shown a tendency to biomagnify within aquatic food webs as other metals (Obiakor et al. 2017). Ambient water quality criteria for the protection of aquatic life have not been established for antimony. Average antimony concentrations currently exceed the analysis criteria at every assessment node except YP-T-11 in Fiddle Creek (Table 3.12-20).

**Arsenic**

Arsenic criteria are specific to the inorganic form, which is the more toxic form to aquatic life and humans. Arsenic exposure can occur through both waterborne concentrations and through dietary exposure for aquatic life and humans. In the State of Idaho, criteria exist for both the protection of human health and the protection of aquatic life. NMFS directed the human health standard be used until new aquatic life criterion can be promulgated by EPA. Arsenic can concentrate in tissues of fish, but it does not biomagnify. The effects of arsenic on fish health include enzymatic, genetic, and immune system.
failure (Kumari et al. 2017). Arsenic is a suspected carcinogen in fish and is associated with necrotic and fibrous tissues and cell damage, especially in the liver. Arsenic can result in immediate death through increased mucus production and suffocation. Other effects include anemia and gallbladder inflammation (NMFS 2014).

Arsenic concentrations currently exceed the analysis criteria at all assessment nodes except YP-T-11 in Sugar Creek (Table 3.12-20).

Mercury

Mercury in the environment originates from both natural and anthropogenic (human-caused) sources. However, regionally, the most significant source of mercury in Idaho is air deposition. Methylation is a process by which inorganic mercury is converted to the organic form (methylmercury), which can be present in the water column and is the form that bioaccumulates in tissues of living organisms. Consuming methylmercury that has accumulated in other organisms is the primary form for mercury exposure for humans. Currently, the value of 0.3 milligrams (mg) of MeHg per kilogram of fish tissue wet weight is set at a level to protect the general public from negative effects of mercury during a lifetime of exposure through the consumption of fish. It also is the human health standard of 0.3 milligram per kilogram fish tissue criterion that is protective of aquatic life (IDEQ 2005, 2018). Although the water column-based aquatic life chronic criterion for mercury in Idaho is 0.000012 mg/L (Total), the preferred value used for interpreting risks of mercury contamination to aquatic life is the fish tissue criterion of 0.3 mg/kg wet weight, the same value used for protection of human health (IDEQ 2018).

Predatory species in the food web concentrate the highest amounts of mercury in their tissues, a process called biomagnification. Salmonids in the streams and rivers of Idaho may be the dominant predator species and can concentrate mercury at levels several times that of prey species, such as algae, aquatic insects, and fish that do not feed exclusively on other fish. Generally, piscivorous fish (fish-eating) will bioaccumulate the highest concentration of mercury. Larger fish, which also tend to be older, are expected to bioaccumulate the most methylmercury.

Mercury concentrations currently exceed the 2.0E-6 mg/L analysis criteria at six of the ten nodes including in the East Fork SFSR at nodes YP-SR-10, YP-SR-8, YP-SR-6, YP-SR-4, YP-SR-2, and in West End Creek at node YP-T-6 (Table 3.12-20).

Physical Barriers

Barriers to fish passage can impact the natural movement (e.g., migration) of fish species and fish population dynamics by reducing, or completely blocking, potential habitat during certain life stages. Barriers can impact fish habitat connectivity and disrupt the natural movement of fish and block important habitat for fish during all life cycles, including spawning and rearing. Fish passage barriers were identified and described within the SGP mine site (BioAnalysts 2021). Only the East Fork SFSR downstream of the mine site and Sugar Creek are without artificial (i.e., human-made) barriers (BioAnalysts 2020). Eleven artificial barriers to fish passage and one natural barrier were identified (BioAnalysts 2020). The statuses of these barriers were identified as either complete, meaning no fish species can pass at any time of year, or partial, meaning some or all fish may pass at moderate or high flows, but not at low flows. Artificial barriers can be attributed to various actions, for example,
construction of culverts and stream alteration (BioAnalysts 2020). Of these eleven artificial barriers, six are located in non-fish bearing streams. The remaining five barriers are shown in Figure 3.12-11 and described in more detail in ESS 2019b. Table 3.12-21 presents the amount of total potential fish habitat upstream of each barrier.

BioAnalysts (2020) identified three major barriers to fish movement in the SGP mine site area: 1) the high gradient cascade in the East Fork SFSR upstream of the Yellow Pine pit lake; 2) East Fork SFSR box culvert; and 3) the high gradient cascade in Meadow Creek upstream from the confluence with the EFMC. The high gradient cascade in the East Fork SFSR upstream of the Yellow Pine pit lake is a complete barrier to natural fish passage. The other two major barriers, the East Fork SFSR box culvert and Meadow Creek barriers, are flow-dependent partial barriers that can block seasonal migration, and only hinder migration of fish that reside in or were stocked upstream of the Yellow Pine pit lake (i.e., translocated Chinook salmon).

Peak/Base Flow

USGS data were used to derive peak flow statistics for the ten major drainages in the analysis area (Figure 3.8-3). Results from the peak flow analysis were summarized in the baseline study (HydroGeo 2012b) and are presented in the Water Quantity Specialist Report (Forest Service 2022e). Peak flows were calculated for the bottom of each drainage using the USGS StreamStats program. Predicted peak flows for a 1.5-year event ranged from 1.84 cfs for West End Creek to 237 cfs for the East Fork SFSR, and for a 500-year event they ranged from 13.4 cfs to 931 cfs, respectively. Table 6-5 in the Water Quantity Specialist Report (Forest Service 2022e) provides the maximum flow predicted to occur for various return periods from a 1.5-year event up to a 500-year event.

Base stream flow data were collected in conjunction with surface water quality sampling on a monthly or quarterly basis at 32 non-USGS monitoring stations. The monitoring points were selected at upstream and downstream locations to bracket historical and potential future mining activities in the analysis area (Brown and Caldwell 2017a). Table 6-6 in the Water Quantity Specialist Report (Forest Service 2022e) provides stream flow statistics derived from baseline measurements collected between 2012 and early 2016. The mean flows calculated from this dataset for the East Fork SFSR ranged from 4.47 cfs at the farthest upstream monitoring location to 31.31 cfs at the most downstream location.
Figure 3.12-11
Fish Passage Barriers at the Mine Site
Stibnite Gold Project
Stibnite, ID

Base Layer: Hillshade derived from LiDAR
Chains: Idaho BLM Cartography
Project Components*: SGP Features, Other Features

Source: BioAnalysts 2021

Legend
- Upstream Extent of Fish Presence
- Complete Barrier, Artificial
- Partial Barrier, Artificial
- Partial Barrier, Natural
- Project Components*
- SGP Features
- Other Features
- U.S. Forest Service Wilderness
- Frank Church River of No Return Wilderness
- Monuments
- County
- Road
- Non-fish-bearing Stream
- Streams/River
- Lakes/Reservoir

0 0.3 0.6 Miles
1 inch = 0.6 miles when printed at 11x17

* Project Components include: SGP Features, Other Features

Source: BioAnalysts 2021
Table 3.12-21 Existing Fish Passage Barriers at the Proposed Mine Site and Potential Fish Habitat Under Baseline Conditions

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Status</th>
<th>Potential Bull Trout and Cutthroat Trout Habitat (km)</th>
<th>Potential Chinook Habitat (km)</th>
<th>Potential Steelhead Habitat (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Upstream from Barrier</td>
<td>Total Available</td>
<td>Upstream from Barrier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Fork SFSR above YPP (02) Artificial – Gradient</td>
<td>Complete</td>
<td>32.822</td>
<td>34.042</td>
<td>8.874</td>
</tr>
<tr>
<td>Fiddle Creek (04) Artificial – Gradient</td>
<td>Complete</td>
<td>3.502</td>
<td>34.042</td>
<td>0.34</td>
</tr>
<tr>
<td>Fiddle Creek (200) Artificial – Culvert</td>
<td>Complete</td>
<td>3.462</td>
<td>34.042</td>
<td>0.34</td>
</tr>
<tr>
<td>Meadow Creek (05) Artificial – Gradient</td>
<td>Partial</td>
<td>8.232</td>
<td>34.042</td>
<td>1.024</td>
</tr>
<tr>
<td>East Fork Meadow Creek (06) Natural – Gradient</td>
<td>Partial</td>
<td>2.222</td>
<td>34.042</td>
<td>0.34</td>
</tr>
</tbody>
</table>

1 Not all of the Total Habitat is considered Usable Habitat
2 Results based on Occupancy Probability for bull trout and cutthroat trout
3 Results based on Critical Habitat for bull trout or modeled Critical Habitat for Chinook salmon
4 Results based on potential Intrinsic Potential habitat

km = kilometer; YPP = Yellow Pine pit
Table 3.12-22 shows average monthly stream flows during the August to March low flow period at five gaging stations and location in lower Meadow Creek in the SGP mine site streams for the years 1929 to 2017.

Climate change conditions resulting in increasing air temperatures would potentially transition snow to rain resulting in diminished snowpack and earlier season streamflow along with changes in groundwater recharge to aquifers that discharge to streams. Mean annual streamflow projections suggest a slight increase, but summer low flows are expected to decline (Halofsky et al. 2018).

Table 3.12-22 Average Monthly Stream Flow During the August-March Low Flow Period for 1929 to 2017 at USGS Gaging Stations and One Meadow Creek Location

<table>
<thead>
<tr>
<th>Month</th>
<th>East Fork SFSR above Meadow: 13310800 (cfs)</th>
<th>East Fork SFSR at Stibnite: 13311000 (cfs)</th>
<th>East Fork SFSR above Sugar Creek: 13311250 (cfs)</th>
<th>Sugar Creek above East Fork SFSR: 13311450 (cfs)</th>
<th>Meadow Creek: 13310850 (cfs)</th>
<th>Meadow Creek: MC-6 (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>7.3</td>
<td>15.4</td>
<td>17.3</td>
<td>12.5</td>
<td>4.1</td>
<td>7.7</td>
</tr>
<tr>
<td>September</td>
<td>5.7</td>
<td>11.9</td>
<td>13.1</td>
<td>9.0</td>
<td>3.0</td>
<td>5.9</td>
</tr>
<tr>
<td>October</td>
<td>5.3</td>
<td>11.5</td>
<td>12.6</td>
<td>8.3</td>
<td>3.1</td>
<td>5.8</td>
</tr>
<tr>
<td>November</td>
<td>4.6</td>
<td>10.8</td>
<td>12.8</td>
<td>8.3</td>
<td>3.4</td>
<td>5.8</td>
</tr>
<tr>
<td>December</td>
<td>3.7</td>
<td>9.0</td>
<td>11.0</td>
<td>7.2</td>
<td>2.8</td>
<td>4.8</td>
</tr>
<tr>
<td>January</td>
<td>3.5</td>
<td>8.0</td>
<td>9.9</td>
<td>6.5</td>
<td>2.3</td>
<td>4.2</td>
</tr>
<tr>
<td>February</td>
<td>3.3</td>
<td>7.7</td>
<td>9.5</td>
<td>6.4</td>
<td>1.9</td>
<td>3.8</td>
</tr>
<tr>
<td>March</td>
<td>3.4</td>
<td>8.7</td>
<td>10.5</td>
<td>7.3</td>
<td>2.2</td>
<td>4.3</td>
</tr>
<tr>
<td>Average</td>
<td>4.6</td>
<td>10.4</td>
<td>12.1</td>
<td>8.2</td>
<td>2.9</td>
<td>5.3</td>
</tr>
</tbody>
</table>

MC-6 is located in the lower reaches of Meadow Creek

### 3.13 Wildlife and Wildlife Habitat (Including Threatened, Endangered, Candidate, and Sensitive Species)

#### 3.13.1 Introduction

This section describes the existing (baseline) conditions relevant to wildlife species and supporting habitats that have the potential to be affected by the SGP.

#### 3.13.2 Wildlife and Wildlife Habitat Area of Analysis

The wildlife analysis area covers approximately 613,793 acres of land, with 253,654 acres (41 percent) on the BNF, 127,487 acres (21 percent) on the PNF, 39,988 acres (7 percent) on the Salmon-Challis National Forest (acres that would be directly impacted by the SGP are administered by the PNF), and 192,664 acres (31 percent) outside Forest Service boundaries. The analysis area is shown in Figure 3.13-1. If not discussed in this section, all other wildlife species were analyzed using the HUC 12 wildlife analysis area including Monarch butterfly.
The Canada lynx analysis area includes the seven Lynx Analysis Units (LAUs) located within the wildlife analysis area. LAUs were delineated across the PNF and BNF using fifth-level HUC boundaries, with some using sixth-level HUC boundaries, where applicable. Appendix C of the Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j) contains more information about LAUs. Figure 3.13-2 shows the Canada lynx analysis area, which includes approximately 656,493 acres as defined by the seven LAUs (i.e., Stibnite, Yellowpine, Burntlog, Landmark, Warm Lake, East Mountain, and West Mountain) and the current modeled source habitat for lynx in the Canada lynx analysis area.

NIDGS have a very limited distribution and are only known to occur in three watersheds in Idaho: Brownlee, Little Salmon, and Weiser. (Crist and Nutt 2007). Figure 3.13-3 shows the NIDGS analysis area, which is approximately 17,917 acres and consists of modeled suitable habitat within the HUC12 wildlife analysis area. NIDGS would only have the potential to occur in specific habitats of the wildlife analysis area. Appendix A of the Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j) includes more information about the habitat modeling used for NIDGS.

Habitat for the wolverine within the wolverine analysis area was modeled based on the persistent spring snow model updated for the PNF and BNF (2009-2015) for the Wolverine – Winter Recreation Research Project: Investigating the Interactions Between Wolverines and Winter Recreation study (Heinemeyer et al. 2017). In the wildlife analysis area, wolverines are most likely to use habitats with persistent spring snow cover for denning and winter range and are expected to move through areas without snow at different times of the year. Appendix A of the Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j) includes more information about the habitat modeling used for wolverine. The HUC 12 wildlife analysis area with modeled wolverine habitat is shown on Figure 3.13-4.

The analysis area for Rocky Mountain bighorn sheep (bighorn sheep) is based on the habitat model developed to quantify summer and winter habitat on the PNF. Based on known occupancy in the FCRNRW, the bighorn sheep analysis area also includes acreages in several HUC 12 watersheds on the Salmon-Challis National Forest (Figures 3.13-5 and 3.13-6).

Appendix A of the Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j) provides more information about the bighorn sheep source habitat model.

The riparian analysis area includes any water/wetland features and forested riparian areas (forest types not categorized as PVGs) within the HUC 12 wildlife analysis area. The riparian analysis area was developed to describe existing conditions and potential impacts to the Columbia spotted frog and other associated riparian species. Figure 3.13-7 shows the riparian analysis area, which is approximately 126,942 acres.

### 3.13.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to wildlife and wildlife habitat. Additional descriptions of these regulations can be found in the SGP Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j).
Land and Resource Management Plans: The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired conditions for wildlife and wildlife habitat and include various objectives, guidelines, and standards for this purpose.

The Payette and Boise Forest Plans include management direction for wildlife and wildlife habitat, including TEPC species. The Forest Plans prescribe management direction in order to achieve the desired outcomes and conditions for wildlife and wildlife habitat. Both the Payette and Boise Forest Plans have numerous goals, objectives, guidelines, and standards related to special status and general wildlife species.

Endangered Species Act: The ESA (16 USC 35 1531 et seq. 1988) provides for the protection and conservation of threatened and endangered species and their Critical Habitats. Section 7 of the ESA (16 USC 35.1531 et seq.) requires all federal agencies to consult or confer with the USFWS and/or the NMFS or NOAA Fisheries, collectively known as “the Services”, which share regulatory authority for implementing the ESA. Federal agencies must submit a Section 7 package for proposed actions that may affect ESA-listed species, species proposed for listing, or designated Critical Habitat for such species. The USFWS generally manages ESA-listed terrestrial and freshwater plant and animal species.

Migratory Bird Treaty Act (MBTA): The MBTA (16 USC 703–712) provides protection for all migratory bird species. The MBTA specifically prohibits any action to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird.” (16 USC 703). The current list of migratory bird species can be found in 50 CFR Part 10.13.

Bald and Golden Eagle Protection Act (BGEPA): The BGEPA (16 USC 668-668d) provides protection for bald and golden eagles, including prohibition of interference with normal foraging, nesting, and rearing activities. This protection is separate from any ESA designation for either species. Additionally, the USFWS has developed the National Bald Eagle Management Guidelines to advise landowners, land managers, and others who share public and private lands with bald eagles when and under what circumstances the provisions of the BGEPA may apply to their activities.

Fish and Wildlife Coordination Act: The Fish and Wildlife Coordination Act (Act of March 10, 1934) authorizes the Secretaries of Agriculture and Commerce to provide assistance to, and cooperate with, federal and state agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife. Amendments enacted in 1946 require consultation with the USFWS and the fish and wildlife agencies of states where the “waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified” by any agency under a federal permit or license. Consultation is to be undertaken for the purpose of “preventing loss of and damage to wildlife resources.”
Habitat model inputs are within the Payette and Boise National Forests Administrative Boundaries. Input data does not exist off-Forest or on the Salmon-Challis National Forest for the models used.

Base Layer: USGS Shaded Relief Service

Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest; USGS

LEGEND
- Sixth-Level Hydrological Units
- Wildlife Analysis Area
- Other Features
  - U.S. Forest Service
  - Wilderness
  - Stibnite Historic Disturbance
  - County
  - City/Town
  - Railroad
  - State Highway
  - Road
  - Lake/Reservoir
  - Stream/River

Figure 3.13-1
Wildlife Analysis Area
Sixth-Level Hydrological Units
Stibnite Gold Project
Figure 3.13-2
Canada Lynx Habitat
Stibnite Gold Project
Stibnite, ID
Figure 3.13-3
Northern Idaho Ground Squirrel (NIDGS) Habitat
Stibnite Gold Project Stibnite, ID

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest; USGS

Legend
- Wildlife Habitat Analysis Area
- Affecting Environment
- Existing Condition Analysis Area
- Northern Idaho Ground Squirrel Modeling Habitat
- Stibnite Historic Disturbance

Project Components
- GSF Features
- Access Roads & Trail System
  - Burning Route
  - Johnson Creek Route
  - Groomed OSV Route
  - Cell Tower Access
- Public Access Road
  - Burning Route Borrow Source
  - Johnson Creek Route Source

Utilities
- New Transmission Line
- Upgraded Transmission Line
- New Substation
- Existing Substation
- New Power Site
- Existing Communication Tower
- New Cell Tower

Offsite Facilities
- Burning Maintenance Facility
- Landmark Maintenance Facility

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

Project Components are associated with Burning Route and Johnson Creek Route only
Burning Route Borrow Source
Johnson Creek Route Source

Note: The McGill - Stibnite Road (CR 50 - 412) connects to Warm Lake Road (156) from Warm Lake Substation to Warm Lake Substation Road. Burning Route only.

Adams County, Valley County, Custer County, Boise National Forest, Payette National Forest, Salmon-Challis National Forest

Thundertop Lookout
Thunderhorn Substation
Warm Lake Substation

OSV TRAILS INSET

Public Access Road
Burning Route
Johnson Creek Route
Groomed OSV Route
Cell Tower Access
Public Access Road

Utilities
New Transmission Line
Upgraded Transmission Line
New Substation
Existing Substation
New Power Site
Existing Communication Tower
New Cell Tower

Offsite Facilities
Burning Maintenance Facility
Landmark Maintenance Facility

Other Features
U.S. Forest Service
Wilderness
County
City/Town
Monumental Summit
Railroad
State Highway
Road
Stream/River
Lake/Reservoir

Project Components are associated with Burning Route and Johnson Creek Route only
Burning Route Borrow Source
Johnson Creek Route Source

Note: The McGill - Stibnite Road (CR 50 - 412) connects to Warm Lake Road (156) from Warm Lake Substation to Warm Lake Substation Road. Burning Route only.
Figure 3.13-4
Wolverine Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND

- Wolverine Habitat Analysis Area Affected Environment
- Habitat Analysis Area
- Number of Years with Persistent Snow Cover between 2009 and 2015
  - 0
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7

- Stibnite-Hiopic: Disturbance

Project Components

- Access Roads & Trail System
  - Burnt Log Route
  - Johnson Creek Route
  - Grooved OSV Route
  - Cell Tower Access Road
  - Public Access Road
  - Burnt Log Route Bore Site Source
  - Johnson Creek Route Source

- Utilities
  - New Transmission Line
  - Upgraded Transmission Line
  - New Substation
  - Existing Substation
  - New Repeater Site
  - Existing Communication Tower
  - New Cell Tower

- Offsite Facilities
  - Burnt Log Maintenance Facility
  - Landmark Maintenance Facility

Other Features

- US Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
  - Railbed
  - State Highway
  - Road
  - Streams/Wr.
  - Lakes/Reservoirs

- 1 inch = 4.5 miles

- Project Components are associated with Burnt Log and Johnson Creek Routes.
- *Substation locations are approximate.
- ** Assumed with Burnt Log Route only.
- *** Associated with Johnson Creek Route only.
- Note: The McCull - Stibnite Road (CR 90-413) connects the Old Creek Road and the County Road System. Other adjacent routes are shown in the inset map.
Figure 3.13-5
Bighorn Sheep (Summer) Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND
- **Wildlife Habitat Analysis Area**
- Affected Environment
- Existing Condition Analysis Area
- Bighorn Sheep Summer Middens Habitat
- Stibnite Historic Disturbance

Project Components *
- **Site Features**
  - Access Roads & Trail System
    - Burning Route ***
    - Johnson Creek Route
    - Groomed OSV Route
    - Cell Tower Access Road
  - Burning Route Borrow Source ***
  - Johnson Creek Route Source ****
- **Utilities**
  - New Transmission Line
  - Upgraded Transmission Line
  - New Substation **
  - Existing Substation **
  - New Repeat Site
  - Existing Communication Tower
  - New Cell Tower

Offsite Facilities
- Burning Maintenance Facility ***
- Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service Wildlife
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

*Project Components are associated with Burning Route and Johnson Creek Route
**Substation locations are approximate
***Associated with Johnson Creek Route only
****Associated with Burning Route only
Note: The McCall - Stibnite Road (CR 19-112 continues south of Lake Fork Road and is a State Park Road) and Idaho River Road (east fork road) are all State Roads.
Figure 3.13-6
Bighorn Sheep (Winter) Habitat
Stibnite Gold Project
Stibnite, ID
Figure 3.13-7
Riparian Habitat Stibnite Gold Project Stibnite, ID
Migratory Birds, EO 13186 of January 10, 2001: EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds (66 Federal Register 3853; January 2001) directs federal agencies to protect migratory birds. The USDA, Forest Service, and the USFWS signed a memorandum of understanding in December 2018 that outlines a collaborative approach to promote the conservation of migratory bird populations. The memorandum of understanding between the Forest Service and USFWS was designed to complement EO 13186.

Hunting Heritage and Wildlife Conservation, EO 13443 of August 20, 2007: EO 13443 Facilitation of Hunting Heritage and Wildlife Conservation (72 Federal Register 46537, August 20, 2007) directs appropriate federal agencies to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

State and Local Law: Idaho Code (Title 36) establishes the Idaho Fish and Wildlife Commission and the IDFG. It establishes fish and wildlife as the property of the citizens of Idaho and gives authority to IDFG to protect, preserve, perpetuate, and manage the state’s fish and wildlife resources. The Commission has approved several fish and wildlife management plans that are relevant to the SGP. These include the Idaho Mule Deer Management Plan 2008-2017, the Idaho Elk Management Plan 2014-2024, the Management Plan for the Conservation of Wolverines in Idaho 2014-2019, and the Idaho State Wildlife Action Plan.

3.13.4 Affected Environment

The following subsections describe the existing conditions of TEPC species; focal species (including Region 4 Sensitive Species and MIS); Idaho Species of Greatest Conservation Need (SGCN); big game species; and migratory birds.

3.13.4.1 General Wildlife Habitat

Existing disturbance within the analysis area includes legacy mining-related disturbance and existing roads and trails. Legacy mining-related disturbance is primarily within the SGP mine site area with an estimated 1,593 acres of existing disturbance within areas that would be encompassed by the SGP under all alternatives.

Vegetation Conditions Related to Wildlife Habitat

The Forest Service maps PVGs and existing vegetation on the PNF and BNF (Forest Service 2005a). This mapping is available only for NFS lands. Both existing vegetation and PVG mapping are useful to understand the vegetation community characteristics of a site, and as such, both datasets are referenced and used as the basis for describing existing conditions and analysis of impacts to wildlife habitat. Most focal species models applied in this analysis use a combination of PVG, canopy cover, and tree size class to define and model source habitat both within and outside historic range of variability (HRV) conditions.

Potential Vegetation Groups

PVGs are generally a description of the climax plant community (final stage in ecological succession) that could be supported by a site, as determined by abiotic conditions such as climate, soil types, hydrological conditions, and topographical aspect. PVG descriptions derived from Payette and Boise Forest Plans
(Forest Service 2003a, 2010a) are presented in the Section 3.10 and the SGP Vegetation Specialist Report (Forest Service 2022g).

**Existing Vegetation**

The Vegetation Classification Mapping and Quantitative Inventory (VCMQI) existing vegetation types (Forest Service 2016b, 2017a) can be used to describe seral-stage (intermediate ecological succession) plant community composition as it was at the time of the most recent mapping. Existing vegetation mapping typically describes the current dominant vegetative cover or species occupying a site and is frequently updated to reflect vegetation changes due to disturbance such as fire, insects, and disease.

Vegetation communities in the region are generally coniferous forests typical of high mountain regions in Idaho and the inland northwestern U.S. The most common unburned existing vegetation types in the region are lodgepole pine forests, subalpine fir forests, Douglas-fir forests, ponderosa pine forests, and Engelmann spruce forests (Forest Service 2022g). Fires routinely occur in the wildlife analysis area and surrounding forests, and as such, much of the wildlife analysis area and vicinity is mapped as burned herb lands (grasses and forbs), burned sparse vegetation, and burned forest shrublands.

Riparian habitats are present along numerous waterbodies. Existing vegetation types in the vegetation analysis area are discussed further in Section 3.10.

**Tree Canopy Cover Class**

The Forest Service tracks the canopy cover class (i.e., how dense the tree canopy is) of the various VCMQI existing vegetation types (Forest Service 2016b, 2017a), which can be further used to assess specific habitat preferences for terrestrial wildlife species. Because of past disturbance from mining activity and large wildfires, tree canopy closure is low across many portions of the wildlife analysis area.

**Tree Size Classes**

The Forest Service categorizes tree size classes (i.e., how large the trees are) of the various VCMQI existing vegetation types (Forest Service 2016b, 2017a), which can be further used to assess specific habitat preferences for terrestrial wildlife species. Tree size classes in the wildlife analysis area also have been affected by past disturbance, including fire. A small percentage of the wildlife analysis area consists of large tree size classes (greater than 20 inches dbh). Small (5 to 10 inches dbh) and medium (10 to 20 inches dbh) tree size classes are more common throughout the wildlife analysis area. Sapling (0.1 to 5 inches dbh) and non-forested tree size classes are much less prevalent.

**3.13.4.2 Threatened, Endangered, Proposed, and Candidate Species**

Four TEPC species are either known to occur, or have the potential to occur, in the wildlife analysis area, and all four have their own species-specific analysis area within the broader wildlife analysis area. These species include Canada lynx, NIDGS, wolverine, and Monarch butterfly (Table 3.13-1). An additional federal threatened species, the yellow-billed cuckoo (*Coccyzus americanus*), was considered but dismissed from this analysis. There are no documented occurrences or potentially suitable habitat for this species in the SGP area and vicinity (Strobilus Environmental 2017). Additionally, results of a query of the USFWS Information, Planning, and Conservation Online Database for the SGP area did not include this species (USFWS 2019a).
<table>
<thead>
<tr>
<th>Suite</th>
<th>Habitat Family</th>
<th>Focal Species Considered in this Analysis</th>
<th>Scientific Name</th>
<th>Species Status</th>
<th>Occurrence in the Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Only</td>
<td>1—Low Elevation, Old Forest</td>
<td>White-headed Woodpecker</td>
<td><em>Picoides albolarvatus</em></td>
<td>S/MIS</td>
<td>Limited source habitat and occurrence in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lewis’s Woodpecker</td>
<td><em>Melanerpes lewis</em></td>
<td>S</td>
<td>Limited source habitat and occurrence in analysis area.</td>
</tr>
<tr>
<td></td>
<td>2—Broad Elevation, Old Forest</td>
<td>American Three-toed Woodpecker</td>
<td><em>Picoides tridactylus</em></td>
<td>S</td>
<td>Dependent mostly on disturbance events, such as fire or insect infestation. Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black-backed Woodpecker</td>
<td><em>Picoides arcticus</em></td>
<td>S/MIS</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boreal Owl</td>
<td><em>Aegolius funereus</em></td>
<td>S</td>
<td>Species documented and source habitat occurs, mostly at higher elevations, in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dusky Grouse (summer)</td>
<td><em>Dendragapus obscurus</em></td>
<td>F</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fisher</td>
<td><em>Martes pennanti</em></td>
<td>S</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flammulated Owl</td>
<td><em>Otus flammeolus</em></td>
<td>S</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Great Gray Owl</td>
<td><em>Strix nebulosa</em></td>
<td>S</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northern Goshawk (summer)</td>
<td><em>Accipiter gentilis</em></td>
<td>S</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pileated Woodpecker</td>
<td><em>Dryocopus pileatus</em></td>
<td>MIS</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silver-haired bat</td>
<td><em>Lasionycteris noctivagans</em></td>
<td>F</td>
<td>Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td>3—Forest Mosaic</td>
<td>Canada Lynx</td>
<td><em>Lynx canadensis</em></td>
<td>T</td>
<td>Rare. Modeled source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mountain Quail</td>
<td><em>Oreortyx pictus</em></td>
<td>S</td>
<td>Source habitat in analysis area, rare species occurrence.</td>
</tr>
<tr>
<td>Suite</td>
<td>Habitat Family</td>
<td>Focal Species Considered in this Analysis</td>
<td>Scientific Name</td>
<td>Species Status</td>
<td>Occurrence in the Analysis Area</td>
</tr>
<tr>
<td>-------</td>
<td>----------------</td>
<td>------------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wolverine</td>
<td>Gulo</td>
<td>PT</td>
<td>Species documented and high-quality habitat in analysis area. Potential denning habitat (i.e., high elevation cirques, talus slopes, and forests) present.</td>
</tr>
<tr>
<td>Combination of Forest &amp; Rangeland</td>
<td>5—Forest &amp; Range Mosaic</td>
<td>Gray Wolf</td>
<td>Canis lupus</td>
<td>S</td>
<td>Species (known packs) documented and habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peregrine Falcon</td>
<td>Falco peregrinus</td>
<td>S</td>
<td>Species documented and known habitat, including nesting sites on the BNF, within analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rocky Mountain Bighorn Sheep</td>
<td>Ovis canadensis</td>
<td>S/BG</td>
<td>Species documented (known herds in FCRNRW) and winter and summer habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rocky Mountain Elk</td>
<td>Cervus canadensis</td>
<td>BG</td>
<td>Source habitat present throughout analysis area.</td>
</tr>
<tr>
<td></td>
<td>7—Forests, Woodlands, &amp; Sagebrush (Not addressed in the analysis)</td>
<td>Spotted Bat (Species not analyzed)</td>
<td>Euderma maculatum</td>
<td>S</td>
<td>Some suitable habitat in analysis area, but not expected to occur. Rare.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Townsend’s Big-eared Bat</td>
<td>Corynorhinus townsendii</td>
<td>S</td>
<td>Species documented and suitable habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northern Idaho Ground Squirrel</td>
<td>Urocitellus brunnneus</td>
<td>T</td>
<td>Modeled source habitat in analysis area. Historical occurrence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monarch butterfly</td>
<td>Danaus plexippus</td>
<td>C</td>
<td>Some suitable habitats in the analysis area, but not expected to occur. Rare.</td>
</tr>
<tr>
<td>Riverine &amp; Non-riverine Riparian &amp; Wetland</td>
<td>13—Riverine Riparian &amp; Wetland (Not addressed in the analysis)</td>
<td>Bald Eagle</td>
<td>Haliaeetus leucocephalus</td>
<td>S</td>
<td>Species documented and known habitat, including nesting sites, within analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbia Spotted Frog</td>
<td>Rana luteiventris</td>
<td>S</td>
<td>Source habitat occurs in riparian &amp; wetland areas. Species documented and source habitat in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harlequin Duck (Species not analyzed)</td>
<td>Histrionicus</td>
<td>S</td>
<td>Source habitat present in some low gradient sections of analysis area. Rare. No known observations in analysis area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow-billed Cuckoo (Species not analyzed)</td>
<td>Coccyzus americanus</td>
<td>T</td>
<td>Analysis area outside of USFWS modeled habitat and known occurrence.</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.

1Species Status (USFWS 2019a): T = ESA Threatened; PT = Proposed ESA Threatened; C = ESA Candidate; S = Region 4 Sensitive; MIS = PNF and BNF MIS, F = Focal Species, BG = Big Game, R4 = Region 4.
**Canada Lynx**

The Final Rule to list the Canada lynx as threatened under ESA by the USFWS was issued in March 2000 (65 Federal Register 16052). In 2000, the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000) was developed to provide a consistent and effective approach to conserve Canada lynx on federal lands. The PNF and BNF amended their existing plans in 2003 to be consistent with the LCAS.

Critical habitat for lynx was designated by the USFWS on February 25, 2009 (74 Federal Register 8616) and revised on September 12, 2014 (79 Federal Register 54781). Critical habitat for Canada lynx has been designated by the USFWS in five core units: Unit 1 in Maine, Unit 2 in Minnesota, Unit 3 in Montana and Idaho, Unit 4 in Washington, and Unit 5 in Wyoming and Montana (74 Federal Register 8616). The Idaho portion of Unit 3 is located outside the Canada lynx analysis area for the SGP in the extreme eastern border of Boundary County in the northern “panhandle” region of the state, approximately 280 miles away. No Critical Habitat has been designated on the PNF or BNF and core, secondary, and peripheral areas delineated for the Recovery Outline for the Contiguous U.S. Distinct Population Segment of Canada Lynx describe the forests as a secondary area (USFWS 2005). The LCAS updated in 2013 (Interagency Lynx Biology Team 2013) also describes the PNF and BNF as secondary areas. Secondary areas are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. (USFWS 2005).

Canada lynx occur throughout Canada and Alaska, in the northern and central Rocky Mountains, and in the extreme northeastern and north-central U.S. Most lynx occurrences in the western U.S. are associated with mixed-conifer forest with the highest percentage (77 percent) occurring at the 4,921- to 6,562-foot elevation zone (McKelvey et al. 2000). Subalpine fir, Engelmann spruce, and lodgepole pine forest cover types in cold, moist PVGs provide the predominant habitat type for lynx (Aubry et al. 2000). Dry forest cover types, such as ponderosa pine forest, are not expected to provide lynx habitat. Typical prey species include snowshoe hares, squirrel species, grouse species, porcupines, beaver, small rodents, and even deer species opportunistically (Interagency Lynx Biology Team 2013). However, because snowshoe hare are the primary prey of lynx throughout their range, lynx distribution is closely associated with snowshoe hare distribution. Enhancing and protecting snowshoe hare habitat is a management priority in secondary areas (Interagency Lynx Biology Team 2013). Canada lynx typically use boreal forest landscapes with a mosaic of successional forest types that contain the following features (USFWS 2009):

- Presence of snowshoe hare and their preferred habitat conditions, which include dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface.
- Winter snow conditions that are generally deep and fluffy for extended periods of time.
- Sites for denning that have abundant, coarse, woody debris, such as downed trees and root wads.
- Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) that lynx are likely to travel through while accessing patches of boreal forest in a home range.
Canada lynx habitat was mapped on the PNF and BNF and relies on specific habitat types in specific structural stages within certain PVGs, which is unlike other species models that only use PVGs with structural conditions (e.g., tree size class and canopy cover). The PNF and BNF use two classifications for lynx habitat in LAUs: “existing suitable habitat” and “source habitat capacity.” “Existing suitable habitat” meets forest criteria that is currently suitable for use by lynx and is defined by parameters such as post-burn habitat (defined to better represent horizontal cover in snowshoe hare habitat), road density, and plantation age. Habitat modeling parameters are based on previously defined relationships among vegetation, snowshoe hare, and lynx. “Source habitat capacity” has the potential to develop into suitable lynx habitat in the future. The source habitat capacity model predicts the potential for overall lynx habitat capacity, including primary (breeding) and secondary habitat. It defines acreages of vegetative communities (in selected PVGs), which include preferred habitat types such as Engelmann spruce, lodgepole pine, and mixed-conifer types with Douglas fir and subalpine fir. However, the lynx habitat models are limited by inadequate data for various habitat features (e.g., tree size class, tree canopy cover, dead and downed wood, snag density, and understory cover), and overestimate existing and source habitat capacity acreages as a result. The PNF and BNF maintain the lynx habitat classes as a spatial database for analysis using Geographic Information Systems. Table 3.13-2 summarizes the areas of existing and unsuitable lynx habitat in each LAU, and whether the LAU currently meets the Forest standard for suitable habitat.

Table 3.13-2 Lynx Habitat Acreage by Lynx Analysis Unit in the Canada Lynx Analysis Area

<table>
<thead>
<tr>
<th>LAU</th>
<th>Total LAU Acreage (Acreage Within Analysis Area)</th>
<th>Existing Suitable Habitat</th>
<th>% of Unsuitable Habitat</th>
<th>Currently Meets Standard TEST15 (&lt;30% Unsuitable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stibnite</td>
<td>81,895</td>
<td>23,880</td>
<td>39.8</td>
<td>No</td>
</tr>
<tr>
<td>Yellowpine</td>
<td>48,074</td>
<td>9,107</td>
<td>70.5</td>
<td>No</td>
</tr>
<tr>
<td>Burntlog</td>
<td>51,857</td>
<td>15,507</td>
<td>55.0</td>
<td>No</td>
</tr>
<tr>
<td>Warm Lake</td>
<td>67,282</td>
<td>1,887</td>
<td>94.1</td>
<td>No</td>
</tr>
<tr>
<td>Landmark</td>
<td>44,494</td>
<td>7,560</td>
<td>78.5</td>
<td>No</td>
</tr>
<tr>
<td>East Mountain</td>
<td>109,445</td>
<td>25,254</td>
<td>12.4</td>
<td>Yes</td>
</tr>
<tr>
<td>West Mountain</td>
<td>95,838</td>
<td>18,953</td>
<td>1.5</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>498,885</strong></td>
<td><strong>102,147</strong></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Forest Service 2018a.

1 Acreage based only on NFS lands. Canada lynx analysis area (656,493 acres) includes NFS and non-NFS lands.

There are approximately 102,147 acres of existing suitable habitat for Canada lynx in the PNF and BNF LAUs listed above (i.e., Canada lynx analysis area), and 220,260 acres of source habitat capacity (i.e., extent of PVGs or cover types capable of developing source habitat conditions at some point in time and within some defined area [Forest Service 2003a, 2010a]) for the PNF and BNF LAUs. Figure 3.13-2 shows existing suitable the current habitat for Canada lynx. Five of the seven LAUs are currently not meeting Forest TEPC Standard 15 (TEST15); this indicates the percentage of unsuitable habitat in the LAUs is higher than the 30 percent threshold. Wildfires account for the majority of unsuitable habitat in
these LAUs (Forest Service 2018a). Current and historic status of lynx in Idaho and the latest scientific literature predict rare occurrence of lynx in the PNF and BNF. In Idaho, the total population number is unknown, but is expected to be low. Surveys conducted in 2007 using the National Lynx Protocol detected lynx in the BNF but not the PNF. The National Lynx Detection Survey was conducted from 1999 to 2003 in forests with potential to have lynx, including the BNF. A survey grid was established in the Cascade Ranger District in the Burntlog and Yellowpine LAUs from 2001 to 2003. No lynx were detected during those efforts (Forest Service 2018a).

Although there are no corridors or transition habitat in the SGP area, the Forest Service has drafted “lynx linkage areas” because of the importance of habitat connectivity for forest carnivores (Claar et al. 2004). As defined by Claar et al. (2004), lynx linkage areas are, “Habitat that provides landscape connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas where blocks of lynx habitat are separated by intervening areas of non-lynx habitat such as basins, valleys, agricultural lands, or where lynx habitat naturally narrows between blocks. Connectivity provided by linkage areas can be degraded or severed by human infrastructure such as high-use highways, subdivisions or other developments.” Linkage areas for Canada lynx have been estimated to occur North to South across Warm Lake Road (CR 10-579) and East to West across the SFSR (and likely also Johnson Creek Road (CR-10-413), the Stibnite Road portion of the McCall-Stibnite Road (CR 50-412), and the Burnt Log Road (FR 447).

The few historical observations on the BNF Cascade Ranger District indicate that Canada lynx can occur on the PNF and BNF. However, the Forest Service conducted lynx detection surveys on the BNF Cascade Ranger District between 2001 and 2003 (Forest Service 2001, 2002, 2003b), and no Canada lynx were detected during these hair snag/DNA surveys. The closest confirmed lynx detection resulting from formal surveys from the National Survey Grid was on the Lowman Ranger District (BNF) in 1999, approximately 60 miles south of the Village of Yellow Pine area. The lack of lynx detections from the large body of hair snag and remote camera survey work, both in the Canada lynx analysis area and in the larger context of the surrounding ranger districts, suggests Canada lynx is rare in the PNF and BNF, and detections would be more likely to result from a dispersing individual rather than a resident (Forest Service 2018a). Although lynx denning habitat exists on the BNF and is predicted to exist in the future across the PNF, there are no verified lynx dens or confirmed evidence of breeding. At present, occurrence of lynx in the Canada lynx analysis area is speculative.

**Northern Idaho Ground Squirrel**

In 2012, NIDGS was identified as a distinct species (Hoisington-Lopez et al. 2012). NIDGS is now recognized as *Urocitellus brumneus*, while its former subspecies, southern Idaho ground squirrel, is recognized as *Urocitellus endemicus*. The USFWS revised the taxonomy of the species under ESA rulemaking in Federal Register (80 Federal Register 35860).

NIDGS was listed as a threatened species under the ESA, as amended (61 Federal Register 7596). The Final Rule for this listing (65 Federal Register 17779) is dated April 5, 2000. The Recovery Plan for the Northern Idaho Ground Squirrel (Recovery Plan) was completed in 2003 (USFWS 2003). The plan summarizes objectives, criteria, and strategies for recovery of the species. The goal of the Recovery Plan is to increase population size and establish a sufficient number of viable metapopulations so that the
species can be delisted. The number of metapopulations considered to be sufficient for recovery is identified as 10, with each consisting of more than 500 individuals for 5 consecutive years.

A 5-year review of the current ESA classification for NIDGS was completed in 2017 (81 Federal Register 7571-7573). Although numerous conservation actions have been implemented or scheduled by the Forest Service, IDFG, and USGS since the last 5-year review, the recent review determined that the threats identified in the previous status review remained the same, particularly the primary threat of loss of suitable habitat, resulting from meadow invasion by conifers. Development of private lands within their limited range also continues to be a threat. The USFWS has initiated the Recovery Planning and Implementation process for NIDGS.

NIDGS are rare, endemic (i.e., native and restricted to a certain area), small mammals whose current known distribution is limited to a disjunct population in an approximately 2,965-acre area of Valley County and another larger, approximately 265,143-acre, area in Adams County in west-central Idaho. It has one of the smallest ranges of all North American land mammals. In this range, NIDGS occur at approximately 60 sites with an elevation range of 3,445 to 7,546 feet above mean sea level. Occupied sites are variable in size (2.5 to greater than 247 acres) and squirrel density (Wagner and Evans-Mack 2017). Typical habitat includes dry montane meadows or open scablands surrounded by ponderosa pine or Douglas-fir forest (Suronen and Newingham 2013). In March or April, squirrels emerge from their underground burrows to mate and begin their brief aboveground activity period (Yensen 1991). Hibernation starts again in July or early August (Goldberg et al. 2017).

Approximately 2,042 acres of occupied habitat and 60,450 acres of modeled NIDGS habitat occur on the PNF. The largest amount of both habitat types occurs in the Brownlee Watershed in close proximity to Bear, Idaho, which is well north and west of the NIDGS analysis area for the SGP. IDFG monitoring data from 2017 documented 308 individuals at 29 colony sites on PNF lands. Within the HUC 12 wildlife analysis area, there are approximately 17,917 acres of modeled suitable habitat (Figure 3.13-3).

The closest occupied site is located south of Cascade (Wagner and Evans-Mack 2017). In 2018, a survey was conducted in the modeled habitat in Scott Valley (June 19 to July 16) and along the Idaho Power Company transmission line alignment in Trout Creek (July 10 to July 12) (Yensen and Tarifa 2018), and private lands where access was obtained (between June 4 to July 17, 2019) (Yensen and Tarifa 2019). Over the entire geographic extent of 2018 and 2019 surveys, which cover almost the entire disturbance footprint for the SGP, there were no observations of NIDGS or signs of activity. However, during the surveys, areas with moderate to highly suitable habitat were identified for future surveys (Yensen and Tarifa 2018, 2019). Several of the large areas of highly suitable habitat include polygons 18136 at the Cascade Switching Station, 17378, 17379, and 17401 near the SGLF and Scott Valley Substation, 18084 and 18299 east of the Cascade Switching Station, and 17383 and 17211 north of the Cascade Switching Station (Yensen 2019). These areas are shown in more detail on Figure 3.13-3. NIDGS did occur historically in the Warm Lake area but limited surveys have been conducted (Yensen and Tarifa 2019). Although no NIDGS or signs of their activity were observed at sites during the surveys, there is a small possibility that NIDGS may occur in the future at suitable sites. Site checks and formal surveys would be conducted, as needed, prior to ground-disturbing activities in suitable habitat.
**Wolverine**

In February 2013, the USFWS published a proposed rule to list the DPS of the North American wolverine in the contiguous U.S. as a threatened species, citing the primary threat to the species as loss of habitat and range as a result of climate change (USFWS 2013; 78 Federal Register 7863). This decision was subsequently withdrawn. On April 4, 2016, the U.S. District Court of Montana vacated the USFWS’s withdrawal of its Proposed Rule (Case 9:14-CV-00246-DLC, Document 108; 81 Federal Register 71670). At the time of the initial DEIS publication in August 2020 for this Project, the proposed listing was under review and pending a final decision on the status of the species by the USFWS. Therefore, the Forest Service was directed to analyze the species as “proposed-threatened.” Additionally, because wolverines were a proposed species, rather than listed, there was no Critical Habitat designated for the species. On October 8, 2020, the USFWS determined that the best available science showed that the factors affecting wolverine populations are not as significant as believed in 2013 when the USFWS proposed to list the wolverine found in the contiguous U.S. as threatened. Therefore, this species did not meet the definition of threatened or endangered under the ESA and the USFWS withdrew its listing proposal. However, on May 26, 2022, the U.S. District Court of Montana vacated the USFWS’s 2020 decision to withdraw the 2013 proposed rule to list the wolverine as a threatened distinct population segment in the contiguous U.S. Therefore, for this analysis, the wolverine reverts back to its proposed for listing status (i.e., proposed-threatened) under the 2013 proposed rule.

The North American wolverine is the largest terrestrial member of the family Mustelidae (e.g., weasels, badgers, otters, ferrets, martens, minks, and wolverines, among others), with adult males weighing 26 to 40 pounds and adult females weighing 17 to 26 pounds (Banci 1994). Wolverines are opportunistic feeders, consuming a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small animals and birds and eat fruits, berries, and insects (Banci 1994). They have an excellent sense of smell, enabling them to find food beneath deep snow, and can eat frozen meat and crush bones of large prey including deer, elk, and moose.

Wolverines are circumboreal (i.e., generally occurring throughout the northern portion of the northern hemisphere) in distribution, occurring in Europe, Asia, and North America. In western North America, the wolverine historically occurred in Alaska, Washington, Oregon, California, Nevada, Colorado, Utah, Montana, Wyoming, Idaho, and Canada. Wolverine habitat includes alpine tundra and all subalpine and montane forests (Wisdom et al. 2000). In the PNF and BNF, wolverines appear to strongly select for forest edges and concave landscapes, such as valleys. Wolverine distribution in Idaho is strongly correlated with snow, cold temperatures, high elevation montane habitats and rugged terrain, including talus slopes (Inman 2013). Spring snow cover (April 24 to May 15) is the best overall predictor of wolverine occupancy and appropriate levels of snow cover during the denning period is essential for successful wolverine reproduction. Wolverines have an extended mating period (from May to August) and give birth to kits in February to mid-March (IDFG 2014). Dens tend to be in areas of high structural diversity with logs and large woody debris, large boulders, and deep snow (Inman et al. 2007). Den sites are usually located amongst rocks or root wads, within hollow logs, under fallen trees, or in dense vegetation (IDFG 2014). Wolverine summer habitat in Idaho is associated with high-elevation whitebark pine communities with steep slopes and coarse talus (IDFG 2014). The wolverine analysis area includes suitable habitat for the wolverine. The largest amount of high-quality wolverine habitat exists in the SFSR watershed (approximately 231,659 acres), which includes areas adjacent to the FCRNRW.
Although new evidence suggests more social interaction, wolverines tend to be solitary and primarily nocturnal. They are active year-round and will travel during daylight hours. Wolverines have large spatial requirements, with home ranges varying in size depending on sex, age, availability of food, and differences in habitat (Banci 1994). Male and female home ranges in central Idaho are the largest reported for the species (Copeland 1996). A winter recreation study evaluated home range areas and estimated male minimum and maximum home range size at 154 and 833 square miles, respectively, with female ranges estimated from 49 to 162 square miles (Heinemeyer et al. 2017). Food availability and dispersion, spatial configurations of conspecifics (i.e., members of the same species), habitat, and topography also are suggested influences for wolverine home range selection and size (Banci 1994; Copeland 1996; Hornocker and Hash 1981). According to IDFG (2014), wolverines also are territorial, which influences their home ranges, typically reducing its overall size depending on prey availability and the local population of wolverines. While male and female ranges can overlap, males avoid other male territories and females avoid other female territories. This is important because territoriality constraints define how wolverines can react to changes in habitat quality or displacement from occupied habitat.

Wolverines naturally occur at low densities and have low reproductive rates. Wolverine populations in the Rocky Mountains are small (Schwartz et al. 2009). Although there are estimates for population carrying capacity in Idaho, there is currently no valid population estimate (IDFG 2014).

The SGP area is located within two Wolverine Priority Conservation Areas, Tier 1 Game Management Units (GMUs) 25 and 26, as defined by the Management Plan for Conservation of Wolverines in Idaho, 2014-2019 (IDFG 2014). Tier 1 are the highest scoring GMUs based on potential wolverine use, cumulative threats, and amount of unprotected habitat.

Historically, wolverines have been documented on the PNF and BNF within the wolverine analysis area (Table 3.13-3). As shown on Table 3.13-3 several of the observations include the same individuals. In 2010, the PNF, BNF, and Sawtooth National Forest collaborated with the Rocky Mountain Research Station, Round River Conservation Studies, IDFG, and other governmental and non-governmental organizations to assess wolverine populations and evaluate potential impacts to the species from winter recreation. The study was titled Wolverine-Winter Recreation Research Project: Investigating the Interactions Between Wolverines and Winter Recreation, and research efforts simultaneously and intensively monitored both wolverine and winter recreation use using global positioning system monitoring. The final report was released in December 2017 (Heinemeyer et al. 2017). The study results were updated in 2019 (Heinemeyer et al. 2019). Six years of trapping efforts (2010-2015) in the McCall study area confirmed 10 individual wolverines: six females (some of which were denning) and four males. The PNF and BNF contain known breeding habitat, and five den sites for four individuals (females) have been confirmed since 2010.
Table 3.13-3  Wolverine Documentation, including DNA Confirmation, Within or Adjacent to the Wolverine Analysis Area

<table>
<thead>
<tr>
<th>Study/Observation</th>
<th>Dates</th>
<th>Animal ID</th>
<th>Sex/Age/ Status</th>
<th>Trap Type/Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heinemeyer et al. 2017</td>
<td>1/15/2012-3/10/2012</td>
<td>F1.2012</td>
<td>Female/Not denning</td>
<td>Log trap</td>
</tr>
<tr>
<td>Heinemeyer et al. 2017</td>
<td>1/15/2012-3/10/2012</td>
<td>F1.2012</td>
<td>Female/Not denning</td>
<td>Log trap</td>
</tr>
<tr>
<td>IDFG</td>
<td>1/12/2007</td>
<td>N/A</td>
<td>Unknown</td>
<td>Sample - Incidental Observation</td>
</tr>
<tr>
<td>IDFG</td>
<td>9/1/1983</td>
<td>N/A</td>
<td>Unknown</td>
<td>Seen - Incidental Observation</td>
</tr>
<tr>
<td>IDFG</td>
<td>6/12/1982</td>
<td>N/A</td>
<td>Unknown</td>
<td>Seen - Incidental Observation</td>
</tr>
<tr>
<td>IDFG</td>
<td>5/14/2009</td>
<td>N/A</td>
<td>Unknown</td>
<td>Seen - Incidental Observation</td>
</tr>
<tr>
<td>IDFG</td>
<td>4/12/1994</td>
<td>N/A</td>
<td>Male</td>
<td>Hand - Inventory/Targeted Survey</td>
</tr>
<tr>
<td>IDFG</td>
<td>1/15/2014</td>
<td>N/A</td>
<td>Unknown</td>
<td>Hand - Incidental Observation</td>
</tr>
<tr>
<td>IDFG</td>
<td>1/18/2013</td>
<td>N/A</td>
<td>Female</td>
<td>Photographed - Remote Camera Station</td>
</tr>
<tr>
<td>IDFG</td>
<td>3/3/2015</td>
<td>N/A</td>
<td>Female</td>
<td>Photographed - Remote Camera Station</td>
</tr>
<tr>
<td>IDFG</td>
<td>3/4/2015</td>
<td>N/A</td>
<td>Unknown</td>
<td>Photographed - Remote Camera Station</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Camera Observation</td>
</tr>
<tr>
<td>Study/Observation</td>
<td>Dates</td>
<td>Animal ID</td>
<td>Sex/Age/ Status</td>
<td>Trap Type/Observation</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Camera Observation</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Camera Observation</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Camera Observation</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>Male</td>
<td>Gun Brush Hair Snag</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>Female</td>
<td>Gun Brush Hair Snag</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Gun Brush Hair Snag</td>
</tr>
<tr>
<td>Garcia and Associates 2013</td>
<td>2/1/2013-3/1/2013</td>
<td>N/A</td>
<td>N/A</td>
<td>Gun Brush Hair Snag</td>
</tr>
<tr>
<td>Garcia and Associates 2014</td>
<td>1/19/2014-3/19/2014</td>
<td>N/A</td>
<td>Male</td>
<td>Camera Observation; Gun Brush Hair Snag</td>
</tr>
<tr>
<td>Garcia and Associates 2014</td>
<td>1/19/2014-3/19/2014</td>
<td>N/A</td>
<td>Male</td>
<td>Camera Observation; Gun Brush Hair Snag</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.

Modeled persistent spring snow cover was utilized (Heinemeyer et al. 2017) (Table 3.13-4) to describe existing habitat for wolverines. Persistent spring snow cover modeling results largely represent female breeding habitat, and therefore may not account for movements of wolverine at different times of the year within the wolverine analysis area, or their use of varying habitat types.

**Table 3.13-4 Persistent Snow Cover in the Wolverine Analysis Area**

<table>
<thead>
<tr>
<th>Snow Cover Years</th>
<th>Area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>57,705</td>
</tr>
<tr>
<td>2</td>
<td>51,566</td>
</tr>
<tr>
<td>3</td>
<td>53,807</td>
</tr>
<tr>
<td>4</td>
<td>77,266</td>
</tr>
<tr>
<td>5</td>
<td>50,684</td>
</tr>
<tr>
<td>6</td>
<td>32,415</td>
</tr>
<tr>
<td>7</td>
<td>12,340</td>
</tr>
</tbody>
</table>

Figure 3.13-4 shows the distribution of persistent late spring (i.e., April 24 to May 15) snow cover in the wolverine analysis area as modeled for the northern hemisphere from 2009 through 2015 (Heinemeyer et al. 2017). The model uses the number of years (out of seven) in which snow cover was present in the spring in selected terrestrial pixels (very small, mapped areas).

This spring timeframe generally corresponds to the period of wolverine den abandonment. The overall wolverine analysis area includes a variety of habitats, including large areas that would typically not have persistent spring snow cover (i.e., Cascade Lake and Warm Lake Road). These are areas where wolverines are expected to travel through at different times of the year. Most dens and associated breeding habitat have been located in areas that were snow covered for 6 to 7 years. Hence, higher elevations on the eastern side of the wolverine analysis area are more likely to have persistent snow, and therefore higher quality habitat, in more years, compared to western portions of the wolverine analysis area. This has been confirmed by regular documentation of individuals using the area and predicted winter ranges based on global positioning system locations of collared animals.

**Monarch Butterfly**

The monarch butterfly is a candidate for listing under the ESA with a wide range across the U.S. (85 Federal Register 81813). In the west each spring, monarchs migrate to the north and east from coastal California toward the Rocky Mountains and Pacific Northwest (USFWS 2020a). This migration may span several generations of monarchs and the Project vicinity is considered part of the species’ summer breeding range. While seasonally occupying the area, monarchs often remain near water resources (particularly in arid climates) and are largely dependent on milkweed (*Asclepias spp.*) for reproduction. Western monarchs migrate back to coastal California each fall to overwinter. These populations overwinter in coastal groves of blue gum eucalyptus (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), and Monterey cypress (*Hesperocyparis macrocarpa*) (USFWS 2020a).

Range-wide, limited monitoring of the monarch butterfly began in the 1980’s, although large-scale yearly assessments did not begin until 1997. Since 1997, population counts have generally been declining every year (IDFG 2017a). The primary threats impacting monarchs are habitat loss and fragmentation, loss of milkweed, and intensified weather events that impact monarch populations. Surveys for the monarch butterfly have historically focused on locations of milkweed. Milkweed typically occurs in non-forested openings along waterways and may also occur in roadside ditches, agricultural fields, and pastures. Monarch and milkweed suitability models in Idaho show the predicted suitability for milkweed species and monarch butterflies on the PNF in the vicinity of the SGP to be low based on 36 variables such as soils, topography, climate, and distance to water (Svancara et al. 2019). Additional suitability models have also been published by the Xerces society (Xerces Society for Invertebrate Conservation 2018). Areas mapped as ‘Low Suitability’ are typically excluded from project analysis. Floral resources used by monarch butterflies for migration can occur in a broader range of habitats and are not restricted to non-forested vegetation along waterways.
Existing habitat for monarchs on the PNF occurs primarily on the Council and Weiser Ranger Districts, along waterways and where soils are wet, such as wet meadows and ditches. Monarchs only breed where milkweed is present, but they depend on the nectar from various floral resources during migration. It is suspected that monarch presence on the PNF is more closely associated with migration than with breeding, but more data collection and habitat assessment is needed.

While the entirety of the wildlife analysis area is within the species range, most milkweeds in Idaho are in the southern portion of the state between Boise and Twin Falls along the Snake River or in the panhandle portion of the state (Svancara et al. 2019). Surveys have not occurred in the wildlife analysis area for this species; however, according to the USFWS Monarch Conservation Database, only one acre of milkweed with 21 individual plants has been mapped in Valley County, Idaho where the Project occurs (USFWS 2020b). Therefore, while monarchs may occur in the wildlife analysis area, the probability is low.

3.13.4.3 Focal Species, including Region 4 Sensitive Species and Management indicator Species

Many of the focal species selected for analysis for the SGP also are Region 4 Sensitive species. Those species are designated by Forest Service Regional Foresters for specific regions or forests. There are 16 Regional Forester Sensitive Species (sensitive mammals, birds, and reptiles/amphibians) from the Intermountain Region (Region 4 of the Forest Service) included in this analysis (Table 3.13-1).

The following species (R4 Sensitive, MIS, focal species, or big game species) (Table 3.13-1) determined to have suitable habitat and documented occurrence or are assumed to occur in the wildlife analysis area are discussed below. Additional species considered but excluded from this analysis due to the wildlife analysis area being outside of the species range or lack of modeled habitat include Lazuli bunting, spotted bat, Harlequin duck, and yellow-billed cuckoo.

*Habitat Family 1 – Low-Elevation, Old Forest*

Family 1 includes wildlife species associated with low elevation, old forest vegetation types and has been identified as a habitat family of greatest conservation concern, due to widespread and substantial declines in habitat quantity across their range (Wisdom et al. 2000).

Family 1 wildlife species depend on single-story, and to a lesser extent, multi-story, lower elevation old forest stands as source habitats. Family 1 source habitat occurs in large tree, low canopy cover conditions in PVGs 1, 2, 3, and 5, and in those habitat types of PVG 6 where ponderosa pine is a major seral component. Special features of this source habitat are large-diameter live trees and snags (Wisdom et al. 2000). Historically, these habitat types were maintained in a relatively open condition by frequent, nonlethal fire.
White-headed woodpecker. The white-headed woodpecker is a regional endemic species of the Interior Northwest and may be particularly vulnerable to environmental change because it occurs in limited distribution, with narrow habitat requirements in dry conifer forests. The white-headed woodpecker is closely tied to mature ponderosa pine forests, with live and dead ponderosa pine trees greater than (> 20 inches dbh in open canopy conditions. The white-headed woodpeckers also require heterogeneous (i.e., mixed or varied) landscapes characterized by a mosaic of open- and closed-canopied ponderosa pine forest. Although white-headed woodpeckers have not been documented in the analysis area, they may pass through. They are expected to be uncommon and due to specific breeding habitat requirements, are not expected to breed and nest in the wildlife analysis area. The closest recorded observations are approximately 6 miles north and 16 miles west of the SGP (Forest Service 2017c).

On the PNF and BNF, vegetative communities that may provide source habitat conditions include PVGs 1, 2, 3, 5, and 6 (Nutt et al. 2010). While the drier habitat types in PVGs 3 and 6 can develop cover types with ponderosa pine in the larger size classes and open canopies, these conditions are not found as commonly as in PVGs 1, 2, and 5 across the PNF and BNF. Large diameter snags are an essential habitat feature for white-headed woodpecker. Current breeding habitat on the PNF is concentrated on the west side of the Forest, on the Council and New Meadows Ranger Districts. Approximately 5,070 acres of white-headed woodpecker modeled source habitat occurs in the wildlife analysis area (Table 3.13-5; Figure 3.13-8).

Lewis’s Woodpecker. The Lewis’s is closely associated with recent burns and responds favorably to stand-replacing fires (Tobalske 1997), whereas habitat for other Family 1 species is usually maintained by frequent, low-intensity burns that retain large and old-forest habitat. The Lewis’s woodpecker is characterized as a ‘burn specialist’ due to its preference for nesting within burned pine forests. Distribution is closely associated with open ponderosa pine forest in the western U.S. and fire-maintained old-growth ponderosa pine. Suitable habitat conditions include an open canopy, abundant arthropod (e.g., insects and spiders) prey, shrubby understory, and availability of nest cavities and perches. Approximately 4,141 acres of Lewis’s woodpecker modeled source habitat occurs in the wildlife analysis area (Table 3.13-5; Figure 3.13-9).
<table>
<thead>
<tr>
<th>Subwatershed Name</th>
<th>White-headed Woodpecker (Acres)</th>
<th>Lewis’s Woodpecker (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bear Creek-SFSR</td>
<td>76</td>
<td>39</td>
</tr>
<tr>
<td>Beaver Creek</td>
<td>104</td>
<td>26</td>
</tr>
<tr>
<td>Burntlog Creek</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Curtis Creek</td>
<td>167</td>
<td>71</td>
</tr>
<tr>
<td>Ditch Creek-Johnson Creek</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Duck Creek-Cascade Reservoir</td>
<td>112</td>
<td>30</td>
</tr>
<tr>
<td>Goat Creek-SFSR</td>
<td>305</td>
<td>252</td>
</tr>
<tr>
<td>Loosum Creek-East Fork SFSR</td>
<td>1,318</td>
<td>1,000</td>
</tr>
<tr>
<td>Lower Big Creek</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lower Gold Fork River</td>
<td>0.4</td>
<td>0.03</td>
</tr>
<tr>
<td>No Mans Creek-East Fork SFSR</td>
<td>1,096</td>
<td>1,225</td>
</tr>
<tr>
<td>Pearsol Creek-North Fork Payette River</td>
<td>125</td>
<td>23</td>
</tr>
<tr>
<td>Poison Creek-North Fork Payette River</td>
<td>96</td>
<td>24</td>
</tr>
<tr>
<td>Porcupine Creek-Johnson Creek</td>
<td>376</td>
<td>236</td>
</tr>
<tr>
<td>Profile Creek</td>
<td>133</td>
<td>98</td>
</tr>
<tr>
<td>Quartz Creek</td>
<td>564</td>
<td>419</td>
</tr>
<tr>
<td>Riordan Creek</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>Sheep Creek-Johnson Creek</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Six-bit Creek-SFSR</td>
<td>253</td>
<td>151</td>
</tr>
<tr>
<td>Sugar Creek</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Tamarack Creek</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>Trapper Creek-Johnson Creek</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Upper Big Creek</td>
<td>213</td>
<td>58</td>
</tr>
<tr>
<td>Upper Monumental Creek</td>
<td>0</td>
<td>179</td>
</tr>
<tr>
<td>Warm Lake Creek</td>
<td>81</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,070</strong></td>
<td><strong>4,141</strong></td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
Figure 3.13-8
White-headed Woodpecker Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND

- Woodpecker Habitat Analysis Area - Affected Environment
- Existing Condition Analysis Area
- White-headed Woodpecker Modelled Habitat
- Stibnite Historic Disturbance

Project Components *

- SGP Features
- Access Roads & Trail System
- Burning Route ***
- Johnson Creek Route
- Groomed OSV Route
- Cell Tower Access Road
- Public Access Road
- Burning Route Borrow Source $$$

Utilities

- New Transmission Line
- Upgraded Transmission Line
- New Substation **
- Existing Substation ***
- New Repeater Site
- Existing Communication Tower
- New Cell Tower

Offsite Features

- Burning Maintenance Facility $$$
- Landmark Maintenance Facility $$$

Other Features

- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route

** Substation locations are approximate

*** Associated with Burning Route only

**** Associated with Johnson Creek Route only

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Note: The McCall - Stibnite Road (CR 50-412) connects the Great Road, East Fork Forest Service Road, South Fork Forest Service Road, and Stibnite Road.

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Payette National Forest
Salmon-Challis National Forest
Boise National Forest

Adams County
Lake County
Bannock County
McClain County
Custer County

Lake Fork
Lamar
McCall
Stibnite
Cape Horn (historic)
Figure 3.13-9
Lewis’s Woodpecker Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND
Woodpecker Habitat Analysis Area - Affected Environment
Existing Condition Analysis Area
Lewis’s Woodpecker Modelled Habitat
Stibnite Historic Disturbance

Project Components *
SGP Features
Access Roads & Trail System
- Burning Route **
- Johnson Creek Route
- Groomed OSV Route
- Cell Tower Access Road
- Public Access Road
- Burning Route Borrow Source ***
- Johnson Creek Route Source ****

Utilities
- New Transmission Line
- Upgraded Transmission Line
- New Substation **
- Existing Substation **
- New Power Site
- Existing Communication Tower
- New Cell Tower

Offsite Facilities
- Burning Maintenance Facility ****
- Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route only
**** Associated with Johnson Creek Route only

Note: The McCall - Sibnite Road (CR 90-412) connects at mile 9.2 from east to Johnson Creek Road. 
Burning Road (mile 7 from Burntlog Road) at Stibnite Road.

- 1 inch = 4.5 miles
- 0.25 miles
- 0.5 miles
- 1 mile
- 2.5 miles
- 5 miles
- 10 miles

Payette National Forest
Salmon-Challis National Forest
Boise National Forest

Adams County
Nemiah County
Lake County
Mccall
Lake Fork
Dorr
Clouse
West Fork
East Fork
Cape Horn
Cape Horn (historical)

Project Components
Access Roads & Trail System
- Public Access Road
- Johnson Creek Route
- Groomed OSV Route
- Burning Route
- Cell Tower Access Road

Utilities
- New Transmission Line
- Upgraded Transmission Line

Offsite Facilities
- Landmark Maintenance Facility

Other Features
- U.S. Forest Service
- Wilderness
- City/Town
- Railroad
- State Highway
- Stream/River
- Lake/Reservoir

1 inch = 4.5 miles
0.25 miles
0.5 miles
1 mile
2.5 miles
5 miles
10 miles

LEADING
Woodpecker Habitat Analysis Area - Affected Environment
Existing Condition Analysis Area
Lewis’s Woodpecker Modelled Habitat
Stibnite Historic Disturbance

Project Components *
SGP Features
Access Roads & Trail System
- Burning Route **
- Johnson Creek Route
- Groomed OSV Route
- Cell Tower Access Road
- Public Access Road
- Burning Route Borrow Source ***
- Johnson Creek Route Source ****

Utilities
- New Transmission Line
- Upgraded Transmission Line
- New Substation **
- Existing Substation **
- New Power Site
- Existing Communication Tower
- New Cell Tower

Offsite Facilities
- Burning Maintenance Facility ****
- Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route only
**** Associated with Johnson Creek Route only

Note: The McCall - Sibnite Road (CR 90-412) connects at mile 9.2 from east to Johnson Creek Road. 
Burning Road (mile 7 from Burntlog Road) at Stibnite Road.

- 1 inch = 4.5 miles
- 0.25 miles
- 0.5 miles
- 1 mile
- 2.5 miles
- 5 miles
- 10 miles

Payette National Forest
Salmon-Challis National Forest
Boise National Forest

Adams County
Nemiah County
Lake County
Mccall
Lake Fork
Dorr
West Fork
East Fork
Cape Horn
Cape Horn (historical)
Species in Family 2 use late-seral, multi-, and single-layered stages of the montane community as source habitats (Wisdom et al. 2000). Source habitats for some species also include late-seral stages of the subalpine community or the lower montane community, or both. Source habitat for Family 2 overlaps Family 1; however, it encompasses a broader array of cover types and elevations (Wisdom et al. 2000). Family 2 source habitat occurs primarily in PVGs 3 through 11 (Forest Service 2003a, Appendix E), although some species use lower elevation types. Historical fire regimes in Family 2 vary by PVG but are dominated by mixed severity and lethal regimes (Forest Service 2003a, Appendix A).

Species that comprise Family 2 tend to be habitat generalists that use a wide range of conditions. Many are associated with both the large and medium tree size class forests in moderate- to high-stand canopy conditions. Some Family 2 species can take advantage of PVGs that exhibit uncharacteristically high tree densities and amounts of shade-tolerant tree species that have resulted from fire suppression and/or past management activities. As forest conditions increase in density and shade-tolerant species become more common throughout the landscape (either from suppression of fire or past vegetation management), the quantity and interconnectedness of Family 2 habitat increases.

**American (Northern) three-toed woodpecker.** The American three-toed woodpecker uses mature to old-growth, recently burned forests, and areas affected by pine bark beetles (Wiggins 2004). Saab et al. (2018) observed that the American three-toed woodpecker diet can consist almost entirely of spruce beetles, and they feed under the bark of freshly killed Engelmann spruce. The three-toed woodpecker is associated with disturbance events such as mountain pine beetle infestations and wildfire events that create areas with high densities of snags and insect prey (Wisdom et al. 2000). Three-toed woodpecker populations typically peak during the first 3 to 5 years after a fire.

Three-toed woodpeckers can utilize some forested conditions that are not within the historical range of variability (HRV) under PVGs 5 and 11. These conditions generally consist of higher tree densities and more complex vegetative structure than what would have developed when stands in these PVGs were experiencing historical disturbance processes. These dense conditions also would make stands more susceptible to insect infestations or stand-replacing wildfire important for disturbance-related species. For PVG 5, when functioning outside HRV, the Medium-High and High tree canopy cover class are included when in the Medium, Large, and Very Large tree size classes. For PVG 11, when functioning outside HRV, the High tree canopy cover class is included when in the Medium, Large, and Very Large tree size classes.

Although three-toed woodpeckers have not been recorded in the wildlife analysis area, and the closest observation in the Forest Service database is approximately 12 miles north of the wildlife analysis area (Forest Service 2017c), the habitat profile and burn history of the area could be attractive to the species, and it is likely they could occur. Approximately 21,675 acres of American three-toed woodpecker modeled source habitat occurs in the wildlife analysis area (Table 3.13-6; Figure 3.13-10).

**Black-backed woodpecker.** The black-backed woodpecker uses montane and boreal coniferous forests with standing snags. This species is associated with disturbance events such as mountain pine beetle infestations and wildfire that create areas with high densities of snags and insect prey (Wisdom et al.
They are strongly associated with recently burned forests (often colonizing them within one year after a fire) and excavate nests in snags (Saab et al. 2009).

On the PNF and BNF, vegetative communities that may provide source habitat conditions for black-backed woodpecker include PVGs 8, 9, 10, and 11 in the Medium and Large tree size classes and with moderate or high canopy cover (Nutt et al. 2010). PVG 5 also can provide source habitat when outside of the HRV. It is recommended that Medium (10 to 19.9 inches dbh), Large (20 to 29.9 inches dbh), and Very Large (>30 inches dbh) tree size classes be used to model source habitat for the black-backed woodpecker, both for within and outside the HRV. Mountain pine beetle infestations and/or high intensity fire events are primary recycling agents in these PVGs; both are disturbances associated with woodpecker habitat and population irruptions. Snags are a special habitat feature for woodpeckers and provide nesting and foraging opportunities. Approximately 49,424 acres of black-backed woodpecker modeled source habitat occurs in the analysis area (Table 3.13-6; Figure 3.13-11).

**Dusky grouse (summer).** Dusky grouse is a large grouse associated with mountain forest which contain ponderosa and lodgepole pine, aspen, and fir. This species is a forest dwelling grouse native to the Rocky Mountains, a permanent resident on the PNF and BNF, which moves to higher elevations in winter.

While herblands, grasslands, and shrublands (e.g., mountain mahogany, chokecherry, serviceberry, rose, bitterbrush, sagebrush) are commonly described as summer habitat, use of these habitats primarily occurs when they are within or adjacent to forested stands, typically within open ponderosa pine or Douglas fir habitat types (Wisdom et al. 2000). Wisdom et al. (2000) described dusky grouse summer source habitat as contrast habitat that occurs on the interface between forest and openings and generally at lower elevations than in winter. These openings, whether natural or created by harvest or fire, can develop an inter-mix of herb, shrub, and/or seedling vegetation that provides cover and forage for dusky grouse, and yet are still within the larger matrix of a later seral forest. This kind of mosaic commonly occurs in the lower range of tree canopy covers. Approximately 20,509 acres of dusky grouse modeled source habitat occurs in the analysis area (Table 3.13-6; Figure 3.13-12).

**Boreal owl.** The boreal owl requires mature conifer forests with moderate to high canopy cover and snags. This species is strongly associated with higher elevation subalpine fir/spruce-fir habitats (>5,000 feet elevation), where their dominant prey food, red-backed vole, is available. Boreal owls, as secondary cavity nesters, also are highly dependent on pileated woodpeckers and northern flickers for nest cavities. Association of foraging and nesting habitat, snags, and downed wood for nest sites and prey habitat, are special habitat features not represented by the model.

This species has been documented in the wildlife analysis area at higher elevations. The nesting/fledging period is April through July (IDFG 2012). The species has been documented, particularly in the mine site, village of Yellow Pine, and Landmark areas, and most likely breeds in the wildlife analysis area. Approximately 28,602 acres of modeled source habitat is present (Table 3.13-6; Figure 3.13-13).
<table>
<thead>
<tr>
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<td>251</td>
<td>1,010</td>
<td>620</td>
<td>20</td>
<td>1,514</td>
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<td>649</td>
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<td>763</td>
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<td>519</td>
<td>492</td>
<td>0</td>
<td>556</td>
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<td>49</td>
<td>54</td>
<td>24</td>
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<td>Pearsol Creek-North Fork Payette River</td>
<td>12</td>
<td>32</td>
<td>972</td>
<td>8</td>
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<td>373</td>
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<td>36</td>
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<td>Poison Creek-North Fork Payette River</td>
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<td>751</td>
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<td>781</td>
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<td>Quartz Creek</td>
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<td>262</td>
<td>3,114</td>
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<td>Riordan Creek</td>
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<td>635</td>
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<td>Six-bit Creek-SFSR</td>
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<td>Tamarack Creek</td>
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<td>51</td>
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<td>Upper Monumental Creek</td>
<td>735</td>
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<td>Warm Lake Creek</td>
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<td>116</td>
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<td><strong>Total</strong></td>
<td><strong>21,675</strong></td>
<td><strong>49,424</strong></td>
<td><strong>20,509</strong></td>
<td><strong>28,602</strong></td>
<td><strong>19,711</strong></td>
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<td><strong>45,758</strong></td>
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<td><strong>57,719</strong></td>
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</table>

Source: Forest Service 2020e.
Figure 3.13-11
Black-backed Woodpecker Habitat Stibnite Gold Project Stibnite, ID

**LEGEND**
- Woodpecker Habitat Analysis Area - Affected Environment
- Existing Condition Analysis Area
- Black-backed Woodpecker Modelled Habitat
- Stibnite Historic Disturbance

**Project Components**
- GCP Features
- Access Roads & Trail System
  - Burning Route
  - Johnson Creek Route
  - Grove Creek Route
  - Cell Tower Access Road
  - Public Access Road
- Burning Route Borrow Source
- Johnson Creek Route Source

**Utilities**
- New Transmission Line
- Upgraded Transmission Line
- New Substation
- Existing Substation
- New Repeat Site
- Existing Communication Tower
- New Cell Tower

**Offsite Facilities**
- Burning Maintenance Facility
- Landmark Maintenance Facility

**Other Features**
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

*Project Components are associated with Burning Route and Johnson Creek Route
**Associated with Burning Route only
*** Associated with Grove Creek Route only
**** Associated with Burning Route and Grove Creek Route only

Note: The McCull - Stibnite Road (CR 16-512) connects the U.S. Forest Service Trailhead Facility (Burntlog Route) to Stibnite Road (Burntlog Route) and Stibnite Road.*
Figure 3.13-12
Dusky Grouse (Summer) Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND
- Wildlife Habitat Analysis Area
- Affected Environment
- Existing Condition Analysis Area
- Dusky Grouse Summer Modeling Habitat
- Stibnite Historic Disturbance

Project Components *
- SGP Features
- Access Roads & Trail System
  - Burning Route **
  - Johnson Creek Route
  - Groomed OSV Route
  - Cell Tower Access Road
    - Public Access Road
  - Burning Route Borrow Source ***
  - Johnson Creek Route Source ****
- Utilities
  - ** New Transmission Line
  - ** New Substation **
  - ** Existing Substation **
  - ** New Repeater Site
  - ** Existing Communication Tower
  - ** New Cell Tower
- Offsite Facilities
  - ** Burning Maintenance Facility ****
  - ** Landmark Maintenance Facility ****
- Other Features
  - U.S. Forest Service
    - Wilderness
  - County
    - City/Town
    - Monumental Summit
  - Railroad
  - State Highway
  - Road
  - Stream/River
  - Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route only
**** Associated with Johnson Creek Route only

Note: The McCall - Stibnite Road (CR 50-12) connects to the 104N Road east of the Lucky Fork Salmon River Road (CR 50-12) and Idaho Road.
Figure 3.13-13
Boreal Owl Habitat
Stibnite Gold Project
Stibnite, ID
**Fisher.** The fisher, a large member of the weasel family. The species was previously granted candidate species status by the USFWS for the West Coast DPS (68 Federal Register 41169; July 10, 2003), but listing was determined to be “not warranted” for the Rocky Mountain Region DPS (76 Federal Register 38504; June 30, 2011). The Forest Service has fisher survey units located across the PNF and BNF and the most recent state monitoring was conducted in 2018-2019 (IDFG 2019b). Although commercial harvest of fishers in Idaho has been closed for more than 60 years, fisher populations have not recovered in western portions of their range (Lofroth et al. 2010; USFWS 2010). On the PNF, incidental trapping continues to be a mortality issue for fisher.

In the western U.S., fishers use coniferous and mixed mature forests, often in riparian corridors and drainages (Meyer 2007; Raley et al. 2012). Sauder and Rachlow (2014; 2015) found that fisher core use areas were often composed of moderate amounts of high canopy cover forest and moderate landscape edge density, and that forest heterogeneity was an important factor in habitat selection. Olson et al. (2014) also found that the probability of fisher occurrence was highest in mesic (i.e., containing a moderate amount of moisture) forest types with tall trees (i.e., between 25 and 50 meters), high annual precipitation, and mid-range winter temperatures. This is supported by Schwartz et al. (2013), who found that fishers disproportionately used late successional forests with large diameter trees in their study in the Northern Rocky Mountain region. They den in cavities of dead snags, living trees, or in downed trees greater than 20 inches dbh (Meyer 2007). In conifer forests of Idaho, fishers have very large home ranges. Average home range size estimates are approximately 2,400 to 10,000 acres for females and 7,400 to 20,000 acres for males (Jones 1991; Olson et al. 2014).

Vegetative communities that may provide source habitat conditions include PVGs 3, 6, 8, 9, and 10 in medium and large tree size classes and moderate or high canopy cover classes (Nutt et al. 2010). Special habitat features include riparian corridors (travel, prey patches), down logs (resting and den sites), and snags (resting and den sites). Approximately 19,711 acres of modeled source habitat occurs in the wildlife analysis area (Table 3.13-6; Figure 3.13-14).

**Flammulated owl.** Flammulated owl, is a cavity nester that prefers stands of medium to large trees (ponderosa pine, Douglas-fir, and aspen) with moderate canopy closure (Forest Service 2012a). Occupied habitat is strongly associated with upper slopes (upper third) or ridges. This species is highly migratory and, as an insectivore, would only occur in the SGP area during warmer time periods when insects, particularly moths, are available. Breeding home ranges average approximately 35 acres. Nesting occurs in April and May, with fledging typically complete by the end of July (IDFG 2012). At higher elevations, this may fluctuate with prey availability.

Vegetative communities that provide source habitat conditions include PVGs 2, 3, 5, and 6 in the medium and large tree size classes and moderate canopy cover class (Nutt et al. 2010). Historical fire regimes in these PVGs include nonlethal and mixed (Forest Service 2003a, Appendix A). Snags are a special habitat feature for flammulated owls and provide nesting sites. Flammulated owl monitoring transects exist in the SGP area and the species has been documented and breeds in the wildlife analysis area. Approximately 18,321 acres of modeled source habitat is present (Table 3.13-6; Figure 3.13-15).

**Great gray owl.** Great gray owl source habitat includes old forests (multi- and single-story); unharvested, young, multi-story forests; and stand-initiation stages of subalpine and montane forests, including
Engelmann spruce, spruce-subalpine fir, and riparian woodlands (Wisdom et al. 2000). The habitat components considered most important for great gray owl are suitable nesting sites in mature or older forest, with adjacent suitable foraging areas in non-stocked and seedling forests, meadows, and open riparian habitats adjacent to extensive meadows. Large diameter trees or snags are special habitat features for the great gray owl. Great gray owls often use the nests of other raptor species in large, broken-topped trees and are known to nest within northern goshawk nest stands. Though associated with mature to old-growth conifer forests, they forage in open areas within 2 miles of nests, including meadows, bogs, and peatlands (Ulev 2007). Due to their close association with snow cover, breeding season typically lasts from late February to late May on the PNF and BNF.

Vegetative communities on the PNF and BNF capable of providing great gray owl source habitat conditions include PVGs 3, 6, 7, 8, 9, 10, and 11. Many of these PVGs historically had mixed and lethal fire regimes, which can create both open and forested habitats being used by the owls. The model likely greatly overestimates the amount of source habitat because it does not account for forest stands proximate to open meadows or other foraging habitats. Due to their specific habitat requirements, including this habitat mix, great gray owls are expected to be uncommon within the analysis area.

Great gray owls have limited Forest Service documentation in the wildlife analysis area. Strobilus Environmental (2017) indicates that great gray owls have been documented in the Warm Lake and Landmark LAUs. Broadcast surveys were conducted at two sites within the wildlife analysis area and no individual owls were detected (HDR 2017j and 2017k). Approximately 75,932 acres of modeled source habitat is present (Table 3.13-6; Figure 3.13-16).

**Northern goshawk.** The northern goshawk occupies northern conifer forests. Northern goshawks use a variety of forest ages, structural conditions, and successional stages (Griffith 1993), and are associated with shrubland and grassland habitats. The home range for a goshawk pair is up to 6,000 acres (Griffith 1993). Nesting is typically from April through June and fledging is generally complete by the end of August.

Goshawks have been documented at low levels in the wildlife analysis area, specifically in the Burntlog and Stibnite LAUs (Forest Service 2018a; Strobilus Environmental 2017); although there appears to be sufficient habitat for breeding, goshawks are expected to be uncommon. HDR conducted goshawk surveys in 2015 and 2017 in the proposed mine site area at the request of the Forest Service. No adult or juvenile goshawks were observed during broadcast acoustical surveys, and no evidence of nests, whitewash (i.e., urine and feces), prey remains, or molted feathers were observed (HDR 2015b, 2017k).

On both the PNF and BNF, source habitat for northern goshawks occurs in all PVGs except 1 and 11 in the medium and large tree size classes and moderate and high canopy cover class (Nutt et al. 2010). PVGs 2 through 9 are capable of developing multi-layered, mature, and late seral stands with a dense canopy. For some PVGs, such as PVG 6, these conditions occur under historical fire regimes, while other PVGs, such as PVGs 2 and 5, develop these conditions from fire suppression and altered fire regimes.

Approximately 45,758 acres of modeled source habitat is present in the wildlife analysis area (Table 3.13-6; Figure 3.13-17).
Figure 3.13-14
Fisher Habitat
Stibnite Gold Project
Stibnite, ID
Figure 3.13-16
Great Gray Owl Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND
- Wildlife Habitat Analysis Area
- Affected Environment
- Existing Condition Analysis Area
- Great Gray Owl Modeling Habitat
- Stibnite Historic Disturbance

Project Components *

- SGP Features
- Access Roads & Trail System
- Burning Route ***
  - Johnson Creek Route
- groomed OSV Route
- cell tower access road
- Public Access Road
- Burning Route Borrow Source **
  - Johnson Creek Route Source ****

Utilities
- New Transmission Line
- Upgraded Transmission Line
- New Substation **
- Existing Substation **
- New repeater site
- Existing communication tower
- New cell tower

Offsite Facilities
- Burning Maintenance Facility ***
- Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route Borrow Source only
**** Associated with Johnson Creek Route Borrow Source only

Note: The McCall - Stibnite Road (CR 50-412) connects at the County Road East to the East Fork Salmon River Road (East Fork Road) and Stibnite Road
Figure 3.13-17
Northern Goshawk Habitat
Stibnite Gold Project
Stibnite, ID

Legend
- Wildlife Habitat Analysis Area
- Affected Environment
- Existing Condition Analysis Area
- Northern Goshawk Modelled Habitat
- Stibnite Historic Disturbance

Project Components *
- SGP Features
- Access Roads & Trail System
  - Burning Route ***
  - Johnson Creek Route
  - Groomed OSV Route
  - Cell Tower Access Road
  - Public Access Road
- Burning Route Borrow Source ***
  - Johnson Creek Route Source ****

Utilities
- ** New Transmission Line
- ** New Substation
- ** Existing Substation **
- ** New Relay Site
- ** Existing Communication Tower
- ** New Cell Tower

Offsite Facilities
- ** Burning Maintenance Facility ****
- ** Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route only
**** Associated with Johnson Creek Route only

Note: The McCall - Stanley Park CR 50-412 connects with the Salmon-Challis National Forest and the Boise National Forest along the Frank Church-River of No Return Wilderness.

1 inch = 4.5 miles

Map by MCRAE Environmental Services, Inc.
Updated by CBBC 6/6/2022

Adams County
Payette National Forest
Lakeland
Lake Fork
Johnson Creek Route
Sugar Creek Road
Burntlog Road

Payette National Forest
Boise National Forest
Salmon-Challis National Forest

Adams County
Lake County
Valleymoons County
Lake County
Caldwell

Cape Horn (historical)

LEGEND
- Wildlife Habitat Analysis Area
- Affected Environment
- Existing Condition Analysis Area
- Northern Goshawk Modelled Habitat
- Stibnite Historic Disturbance

Project Components *
- SGP Features
- Access Roads & Trail System
  - Burning Route ***
  - Johnson Creek Route
  - Groomed OSV Route
  - Cell Tower Access Road
  - Public Access Road
- Burning Route Borrow Source ***
  - Johnson Creek Route Source ****

Utilities
- ** New Transmission Line
- ** New Substation
- ** Existing Substation **
- ** New Relay Site
- ** Existing Communication Tower
- ** New Cell Tower

Offsite Facilities
- ** Burning Maintenance Facility ****
- ** Landmark Maintenance Facility ****

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with Burning Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with Burning Route only
**** Associated with Johnson Creek Route only

Note: The McCall - Stanley Park CR 50-412 connects with the Salmon-Challis National Forest and the Boise National Forest along the Frank Church-River of No Return Wilderness.

1 inch = 4.5 miles

Map by MCRAE Environmental Services, Inc.
Updated by CBBC 6/6/2022

Adams County
Payette National Forest
Lakeland
Lake Fork
Johnson Creek Route
Sugar Creek Road
Burntlog Road

Payette National Forest
Boise National Forest
Salmon-Challis National Forest

Adams County
Lake County
Valleymoons County
Lake County
Caldwell

Cape Horn (historical)
Pileated woodpecker. Pileated woodpeckers serve a variety of functional roles within the community and are associated with habitat elements used by other species in this family. Pileated woodpeckers occupy dense deciduous, coniferous, or mixed forests; open woodlands; second growth forests; and parks and wooded residential areas of towns. The species prefers habitats with tall, closed canopies and high basal areas. General characteristics of habitat provide opportunities for nesting, roosting, and foraging and include the presence of large diameter trees and snags, multiple canopy layers, decaying wood on the forest floor, and a somewhat moist environment that promotes fungal decay, and ant, termite, and beetle populations to forage upon. Source habitats for pileated woodpeckers are typically late-seral stages of subalpine and montane community types. Home ranges average 1,006 acres.

On the PNF and BNF, vegetative communities that may provide source habitat conditions include PVGs 2, 3, 5, 6, 8, and 9 in the large tree size classes and moderate and high canopy cover class (Nutt et al. 2010). Some PVGs are capable of providing source habitat conditions under historical fire regimes while others do so because of altered fire regimes (i.e., PVGs 2 and 5). Special habitat features for pileated woodpecker include large diameter (>21 inches dbh) snags and hollow live trees for nesting and roosting, and large standing dead and downed trees for foraging. Some of these special habitat features are not well represented by the model. The very large tree size class is very limited in the analysis area. Approximately 1,722 acres of modeled source habitat is present in the wildlife analysis area (Table 3.13-6; Figure 3.13-18).

Silver-haired bat. Silver-haired bat is associated with primarily forested areas adjacent to lakes, ponds, and streams, including areas with human disturbance. They are generally migrant over a major part of their range. Summer roosts are in conifer/deciduous tree foliage, cavities, loose bark, and sometimes in buildings. Day roost trees are usually characterized as large (>21 inches dbh), dead or live with some defect, with loose bark and cracks. Winter habitat includes mines, caves, rock crevices, under tree bark and hollow trees / snags.

Source habitat for resident silver-haired bats is in forested and woodland areas, generally late seral stages of subalpine, montane, lower montane, and riparian woodland community groups. Modeling of source habitat for this species, which consists of both foraging and roosting habitat, utilizes Seedling (<4.5 feet tall), Medium (10 to 19.9 inches dbh), Large (20 to 29.9 inches dbh), and Very Large (>30 inches dbh) tree size classes. Literature also supports use of forested stands in the Low (10 to 19 percent), Low-Medium (20 to 29 percent), and Medium (30 to 44 percent) tree canopy cover classes for preferred PVGs within their HRV. Silver-haired bats have been documented on Forest Service lands in the wildlife analysis area and in the FCRNRW (IDFG 2017a; 2013). Approximately 57,719 acres of modeled source habitat is present in the wildlife analysis area (Table 3.13-6; Figure 3.13-19).

Habitat Family 3- Forest Mosaic

Species within this family tend to be habitat generalists in montane forests. Most species also use subalpine forests, lower montane forests, or riparian woodlands as source habitats. A few species use upland shrub and upland herb communities. Source habitat occurs across all PVGs and structural stages. Three TEPC or Sensitive wildlife species are within Family 3: Canada lynx (discussed in TEPC section), wolverine (discussed in TEPC section), and mountain quail.
Mountain quail. Mountain quail is closely associated with riparian habitats (Forest Service 2012a). Wisdom et al. (2000) describes forest habitat associations for this species as all forested vegetation stages, except stem exclusion (i.e., forest stage where young trees are rapidly competing and growing densely) in Interior Douglas-fir, Interior ponderosa pine, and Western larch cover types.

On the BNF and PNF, vegetative communities that may provide source habitat conditions for mountain quail include PVGs 1, 2, 4, 5, 7, and 11 (Nutt et al. 2010). Historical fire regimes are nonlethal in low elevation types (PVGs 1, 2, and 5) and “mixed1” or “mixed2” in other PVGs. Riparian shrubland is a special habitat feature. In the Interior Columbia Basin, mountain quail are usually found within 100 to 200 meters (328 to 656 feet) of a water source. The source habitat model utilizes Seedling (4.5 feet tall), Sapling (0.1 to 4.9 inches dbh), Small (5 to 9.9 inches dbh), Medium (10 to 19.9 inches dbh), Large (20 to 29.9 inches dbh), and Very Large (>30 inches dbh) tree size classes and selected forested stands in the Low (11 to 19 percent) and Low-Medium (20 to 29 percent) tree canopy cover classes.

Mountain quail are most often found in areas with high abundance of shrubs and the model also includes Very Low (10 to 20 percent) and Low (20 to 30 percent) canopy cover classes for the SHRUB existing vegetation type and Very Low (10 to 20 percent), Low (20 to 30 percent), and Moderate (30 to 40 percent) for the FOREST existing vegetation type to model non-forest source habitat. Although approximately 72,681 acres of mountain quail modeled source habitat occurs in the wildlife analysis area (Table 3.13-7; Figure 3.13-20), the nearest recorded observation is approximately 8 miles west of the northern portion of the analysis area (Forest Service 2017c) and species occurrence is expected to be rare.
Figure 3.13-18
Pileated Woodpecker Habitat
Stibnite Gold Project
Stibnite, ID

LEGEND

- Woodpecker Habitat Analysis Area - Affected Environment
- Existing Condition Analysis Area
- Pileated Woodpecker Modelled Habitat
- Stibnite Historic Disturbance

Project Components *

- BMR Features
- Access Roads & Trail System
- BMR Route ***
- Johnson Creek Route
- Groomed OSV Route
- Cell Tower Access Road
- Public Access Road

- Pileated Woodpecker Borrow Source ***
- Johnson Creek Route Source ****

Utilities

- New Transmission Line
- Upgraded Transmission Line
- New Substation **
- Existing Substation **
- New Radio Site
- Existing Communication Tower
- New Cell Tower

Offsite Facilities

- BMR Maintenance Facility ***
- Landmark Maintenance Facility ****

Other Features

- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Railroad
- State Highway
- Road
- Stream/River
- Lake/Reservoir

* Project Components are associated with BMR Route and Johnson Creek Route
** Substation locations are approximate
*** Associated with BMR Route only
**** Associated with Johnson Creek Route only

![Map of Pileated Woodpecker Habitat Analysis Area](image)

- Payette National Forest
- Salmon-Challis National Forest
- Boise National Forest

Note: The McCall - Stibnite Road (CR 19 & CR 212 connector) is not a CR 19 connector. East Fork Salmon Fork Salmon River Road (East Fork Road) and Stibnite Road.
<table>
<thead>
<tr>
<th>Subwatershed Name</th>
<th>Mountain Quail (Acres)</th>
<th>Rocky Mountain Bighorn Sheep (Acres)</th>
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<tr>
<td></td>
<td></td>
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<td>Summer</td>
<td>Winter</td>
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<td><strong>59,405</strong></td>
<td><strong>10,306</strong></td>
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</tr>
</tbody>
</table>

Source: Forest Service 2020e.
Habitat Family 5 – Forest and Range Mosaic

Family 5 species use a broad range of forest, woodlands, and rangelands as source habitat (Wisdom et al. 2000). Source habitats occur in all PVGs and structural types, as well as woodland and non-forested types. Human disturbance and altered fire regimes are primary factors affecting some species (Wisdom et al. 2000). Species associated with Family 5 potentially in the wildlife analysis are: gray wolf, peregrine falcon, Rocky Mountain bighorn sheep, and Rocky Mountain elk. Of the four species, current habitat modeling is only available for Rocky Mountain bighorn sheep. Remaining species are addressed qualitatively.

Gray wolf. Gray wolves are a Region 4 Sensitive species and are federally listed in several western states, excluding Idaho. Gray wolves in the northern Rocky Mountain states (i.e., Idaho, Montana, and parts of Oregon, Washington, and Utah) were delisted by the USFWS in May 2011. They are habitat generalists with large pack territories of up to 150 square miles (Snyder 1991). Their range is related to availability of prey species, including deer, elk, and, less commonly, moose, bighorn sheep, and domestic stock. Gray wolves are well documented in the wildlife analysis area. Natural Resource Manager (NRM) WILDLIFE records verify occupancy in and around the wildlife analysis area and several packs are known to occur in the FCRNRWA. Garcia and Associates observed tracks during a 2013 winter field study (Forest Service 2017c; Garcia and Associates 2013; Strobilus Environmental 2017). Gray wolves have been observed in the mine site, specifically at the proposed tailings storage facility (in June 1998), main ore processing area (May 2000), and Yellow Pine pit (June 1997) locations. Perpetua staff and consultants have observed gray wolves multiple times during exploration activities in the analysis area (Strobilus Environmental 2017).

Peregrine falcon. Peregrines are cliff nesters, utilizing cliffs from 30 to 400 meters (98 to 1,312 feet) high. Habitat surrounding the cliffs may be variable, ranging from old forests to second growth and sagebrush steppe environments. Common features of nesting habitat include close proximity (1,312 to 2,953 feet) to water, abundant avian prey, and lack of human disturbance during the breeding season (Pagel 1995). Although greater distances may be traveled, peregrines usually hunt within 10 miles of their nests with 80 percent of foraging occurring within 1 mile.

On the PNF and BNF, vegetative communities that could provide source habitat conditions include all forest and non-forest vegetation types. Source habitat is typically located within 10 miles of suitable nesting cliffs. Peregrine falcons have been documented within the wildlife analysis area and nesting has been verified along Johnson Creek and East Fork SFSR since 2000 (Forest Service 2018a). Breeding territories also are documented in the FCRNRW area.

Rocky Mountain bighorn sheep. Human settlement of Idaho in the mid-1800s increased harvest of bighorn sheep and introduced domestic sheep, resulting in a major loss of the species. Disease transmission from domestic sheep to bighorn sheep has resulted in substantial die-offs dating back to the 1870s in the Salmon River Mountains (Smith 1954). Current estimates place bighorn sheep numbers at 10 percent or less of the historic population levels.

Bighorn sheep occupy rugged canyons, foothills, and mountainous terrain at elevations ranging from 1,450 to 10,500 feet and slopes of 45 percent or greater. Key habitat features include steep, rugged escape
terrain, such as cliffs and rockslides; grasses and forbs for forage; and a limited amount of tall vegetation. Wisdom et al. (2000) describes source habitats for bighorn sheep in alpine, subalpine, upland shrubland, and upland herbland community groups. Alpine and subalpine community groups are primarily summer range and upland herbland and shrubland are used in both seasons, depending on elevation (Wisdom et al. 2000).

NRM WILDLIFE has a record of one bighorn sheep on the eastern border of the Stibnite LAU (Forest Service 2017c). They are known to occur in the FCRNRW area, which includes lambing areas for the Big Creek herd and collaring data from the Forest Service. The IDFG (2017b) estimated the bighorn sheep population in the Middle Fork Salmon River Population Management Unit (PMU) to be about 477 individuals in 2017, which was a decrease from survey estimates in 2004, 2006, and 2009. In addition, one bighorn sheep was observed approximately 6 miles northeast of the mine site (Strobilus Environmental 2017).

Bighorn sheep occurrence on the PNF and BNF is concentrated in areas with preferred habitat features such as Hell’s Canyon National Recreation Area and the FCRNRW. Bighorn sheep have been documented in the wildlife analysis area. IDFG collaring data (2017b) verified several existing herds (Pinnacles, Big Creek, Monumental herds) and lambing areas within proximity to the SGP area. Approximately 59,405 acres of summer habitat and 10,306 acres of winter habitat is modeled within the wildlife analysis area, including some habitat on the Salmon-Challis National Forest.

On the PNF and BNF, PVGs 1, 2, 4, 5, 7, 9, 10, and 11 in all tree size classes and with a low canopy cover provide summer source habitat when this habitat is within 2 miles of rock, cliff, or talus slopes with greater than 27 percent gradient. Winter source habitat is composed of numerous sagebrush-dominated cover types when the canopy cover class is low, and these cover types are within 2 miles of rock, cliff, or talus slopes with greater than 27 percent gradient. More information on the PNF bighorn sheep model is available in the PNF Bighorn Sheep Supplemental EIS Technical Report, Source Habitat Model (Forest Service 2010d).

Table 3.13-7 and Figures 3.13-5 and 3.13-6 display modeled summer and winter bighorn sheep habitat occurring in the analysis area.

**Habitat Family 7 – Forests, Woodlands, and Sagebrush**

Species in Family 7 use a complex pattern of forest, woodlands, and sagebrush cover types (Wisdom et al. 2000). A distinguishing feature of the family is that most species have specialized requirements for nesting and roosting, which often limits population size and distribution. Two Region 4 Sensitive wildlife species are members of Family 7: spotted bat and Townsend’s big-eared bat. Due to the rarity of spotted bat, only Townsend’s is addressed qualitatively in this analysis. Another Sensitive species, silver-haired bat (Family 2), which is believed to occur and has suitable habitat in the analysis area, is utilized as a proxy for other bat species.

**Townsend’s big-eared bat.** Townsend’s big-eared bat is a Region 4 Sensitive species and Idaho SGCN (Tier 3), with suitable habitat within the wildlife analysis area. Ponderosa pine, Douglas fir, and grand fir stands are abundant in the analysis area and may be used as summer maternity roost sites. Townsend’s
big-eared bats also will readily use underground mine workings and adits for daytime roosting (Gruver and Keinath 2006). There are no documented occurrences or records of Townsend’s big-eared bat in the wildlife analysis area. The nearest observation is approximately 20 miles north near the Snowshoe Mine on Crooked Creek in Idaho County (in the company of multiple other bat species) according to the NRM WILDLIFE database (Forest Service 2017c). No Townsend’s big-eared bat colonies have been recorded in Valley County as of 1999 (Idaho Conservation Effort 1999). They also have been documented using openings in cliff walls along the Snake River Canyon (Hells Canyon), about 65 miles west of the analysis area (Strobilus Environmental 2017).

**Habitat Family 13 – Riverine Riparian and Wetland**

Source habitat for species in Family 13 occurs in conjunction with riverine riparian and wetland areas. Some species within the family also use non-riverine riparian and wetland habitats. Adjacent forests and woodlands provide nesting sites for some species. Three TEPC or Sensitive wildlife species are members of Family 13: bald eagle, Columbia spotted frog, and yellow-billed cuckoo. Yellow-billed cuckoo is not analyzed as described earlier in this section.

**Bald eagle.** The bald eagle is known to occur along riparian areas and in the vicinity of large waterbodies. The removal of the bald eagle from the Federal List of Endangered and Threatened Wildlife and Plants became effective August 9, 2007. However, the bald eagle is afforded some protections under the Bald and Golden Eagle Protection Act and the MBTA.

Two key habitats have been identified for bald eagles: nesting territory and wintering habitat. Nesting territories are typically associated with large rivers, lakes, reservoirs, or ponds that produce fish (Buehler 2000). Territories are used in successive years and may include more than one nest site. Bald eagles nest relatively close to water (1.25 miles) with suitable foraging opportunities (Buehler 2000). The majority of nest sites are located within one-half mile of a major stream or water body (USFWS 1986).

Wintering habitat also is typically associated with aquatic habitats with some open water for foraging (Buehler 2000). Winter habitat suitability is defined by food availability, the presence of roost sites that provide protection from inclement weather, and the absence of human disturbance (Buehler 2000). Winter food sources (e.g., fish, waterfowl, and ungulate carrion) and their availability varies across bald eagle winter range. Bald eagles scavenging on carcasses off highways are susceptible to motor-vehicle impact injuries. Bald eagles will tolerate some level of human activity in areas of high prey availability.

Key features of source habitat for the bald eagle include available food resources and suitable sites for nesting and roosting. These features can be correlated with watershed pathways used to assess the conditions of the watershed. The pathways that have relevance to the bald eagle include watershed condition, water quality, channel conditions and dynamics, and flow/hydrology.

In the wildlife analysis area, bald eagles have nested at Warm Lake since the early 2000s and they also forage in the lake, as well as in the SFSR (nest site last documented in 2008), and in the Johnson Creek area.

**Columbia spotted frog.** Columbia spotted frogs are aquatic and typically occur in or near permanent bodies of water, such as lakes, ponds, slow-moving streams, and marshes (Gomez 1994). The frogs
generally occur along the marshy edges of such sites where emergent vegetation (e.g., grasses, sedges, cattails) is fairly thick and where an ample amount of dead and decaying vegetation exists. Some occupied sites also may have a layer of algae or small vegetation (e.g., duckweed) on the surface of the water. During summer, they may travel away from breeding sites but are still typically associated with aquatic sites with vegetated margins (Gomez 1994). Given the elevation range of the species, occupied aquatic sites may be surrounded by a wide variety of terrestrial vegetation, including mixed coniferous and subalpine forests, grasslands, and shrub-steppe communities.

Patla and Keinath (2005) describe three seasonally occupied habitats: breeding, foraging, and over-wintering. Breeding sites are used for egg deposition and larval development. These sites consist of stagnant or slow-moving water with some shallow (3.9 to 7.9 inches deep) water available. Emergent vegetation (sedges) is usually present. Foraging habitat is used by all post-larval stages of frogs for prey acquisition. These sites can occur as ephemeral pools in forests and meadows; intermittent and perennial streams; edges of rivers, riparian zones, and lake margins; and marshes. Over-wintering sites provide wet, well-oxygenated habitat that is protected from freezing temperatures. While some sites may be suitable for all three habitats, in many areas, these sites are spatially separated, requiring frogs to migrate between sites within the course of a year.

Key features of source habitat for the Columbia spotted frog include the aquatic site itself, its banks and bank-side vegetation, and the conditions of the surrounding uplands. These features can be correlated with watershed pathways used to assess the conditions of the watershed. The pathways that have relevance to the Columbia spotted frog include watershed condition, water quality, channel conditions and dynamics, and flow/hydrology. No special habitat features have been identified for the Columbia spotted frog.

Individuals have been observed by the Forest Service in the riparian analysis area (Forest Service 2017c), and they were incidentally noted along the East Fork SFSR near the mine site during raptor surveys in spring and summer of 2017 (HDR 2017k). They also may occur in other potentially suitable habitat in the riparian analysis area, such as forested areas adjacent to wetlands which may be used as winter hibernacula.

### 3.13.4.4 Idaho Species of Greatest Conservation Need

In addition to the PNF and BNF sensitive species, SGCN identified for the State of Idaho that may occur in the SGP area also are considered. The SGCN in the Idaho Batholith Ecoregion are discussed in this section (IDFG 2017a, 2017c). Several species have already been assessed as TEPC species and focal species (including Forest Service Region 4 Sensitive and MIS) or are described in the migratory bird species section. The species not described elsewhere are listed in Table 3.13-8.

These SGCN were analyzed in different groups depending on the habitats they generally occupy.

**General Habitats** – SGCN analyzed in this group include common nighthawk, hoary bat, and little brown myotis. The general wildlife analysis area was used for these species given their occupancy across several different habitats.
**Riparian Species** – SGCN analyzed in this group include western toad, western grebe, Clark’s grebe, and sandhill crane. The riparian analysis area was used for these species due to their habitat requirements.

**Alpine Species** – The only SGCN analyzed in this group is the hoary marmot. This species uses subalpine and alpine areas, which overlap much of the wolverine analysis area. While the marmot has a much smaller home range compared to the wolverine, the wolverine analysis area is used for this species because of the overlap in habitat types.

**3.13.4.5 Big Game Species**

Big game species that are expected to be present and have habitat in the wildlife analysis area include Rocky Mountain elk and mule deer (*Odocoileus hemionus*) (Forest Service 2003a, 2010a). These big game species have been recorded in the PNF and/or BNF and also in the wildlife analysis area (Strobilus Environmental 2017). The Atlas of Idaho’s Wildlife shows habitat present in the wildlife analysis area for these two species (IDFG 1997).

Roadless areas are often used for wildlife migration corridors (Forest Service 2007b). Big game species also may use these remote places for calving, escape cover, summer/winter ranges, or migrations between summer and winter ranges. While there are no corridors or transition habitat in the wildlife analysis area (Forest Service 2017d), big game migration routes and transition habitat might occur in the wildlife analysis area, but studies have not been conducted yet to map these big game habitats. Big game species can be legally hunted and are managed by the IDFG. The wildlife analysis area occurs in IDFG Big Game Management Units (BGMUs) 24, 25, 26, and 27.

**Rocky Mountain elk.** Rocky Mountain elk are a priority species/big game species of special interest in the PNF and BNF and are found in a variety of habitats. They are habitat generalists and have been repeatedly observed in and near the wildlife analysis area. The wildlife analysis area near the mine site includes elk winter habitat and predicted elk summer habitat, which could include calving areas.

Habitat use and distribution changes seasonally for this species and can be generalized by seasonal movements. During the winter, snow forces elk to move to lower elevation winter ranges. Winter ranges are often of mixed land ownership and include portions of the PNF and BNF, as well as other public and private lands. As snow recedes, elk follow the spring green-up back to mid- and high-elevation summer ranges located in the PNF (Forest Service 2017d).

IDFG monitors and manages elk at the zone level (i.e., aggregations of several BGMUs). The wildlife analysis area is located in BGMUs that are currently meeting the IDFG bull and cow elk population objectives (IDFG 2017c). BGMUs 24 and 25 are both located in the McCall Elk Zone (the portion of Valley County in the drainage of the SFSR south of the Hall Creek drainage on the east side of the river, and south of the Bear Creek drainage on the west side of the river, except that portion of the Secesh River drainage upstream from and including Paradise Creek drainage). BGMUs 26 and 27 are in the Middle Fork Elk Zone, and are northeast and southeast of the mine site, respectively. In surrounding elk zones that are below objectives, the IDFG is attempting to “increase the populations by reducing or eliminating cow harvest, adjusting bull harvest, and intensively managing predators to reduce the impacts of predation on those herds” (IDFG 2014b, 2017c). In a 2014 survey, IDFG (2018a) estimated a population of 816
individuals in BGMU 25, which was a 41 percent increase from the 2010 survey. No survey data were available for BGMU 24. As of the 2014 survey, the population was estimated to be 5,800 individuals in the McCall Elk Zone (Forest Service 2019c).

### Table 3.13-8 Species of Greatest Conservation Need

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>IDFG Identified Habitats</th>
<th>Species Occurs in Analysis Areas?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Toad</td>
<td><em>Anaxyrus boreas</em></td>
<td>Springs and Groundwater-Dependent Wetlands; Lakes, Ponds, and Reservoirs</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
<tr>
<td>Western Grebe</td>
<td><em>Aechmophorus occidentalis</em></td>
<td>Lakes, Ponds, and Reservoirs</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
<tr>
<td>Clark’s Grebe</td>
<td><em>Aechmophorus clarkii</em></td>
<td>Lakes, Ponds, and Reservoirs</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
<tr>
<td>Sandhill Crane</td>
<td><em>Grus canadensis</em></td>
<td>Riverine–Riparian Forest and Shrubland; Springs and Groundwater-Dependent Wetlands; Lakes, Ponds and Reservoirs</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
<tr>
<td>Common Nighthawk</td>
<td><em>Chordeiles minor</em></td>
<td>Dry Lower Montane–Foothill Forest; Lower Montane– Foothill Grassland and Shrubland; Riverine–Riparian Forest and Shrubland</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
<tr>
<td>Hoary Bat</td>
<td><em>Lasiurus cinereus</em></td>
<td>Dry Lower Montane–Foothill Forest; Subalpine–High Montane Conifer Forest; Lower Montane–Foothill Grassland and Shrubland; Riverine–Riparian Forest and Shrubland; Springs and Groundwater- Dependent Wetlands; Lakes, Ponds, and Reservoirs</td>
<td>Present in wildlife analysis area based on Forest Service surveys.</td>
</tr>
<tr>
<td>Little Brown Myotis</td>
<td><em>Myotis lucifugus</em></td>
<td>Dry Lower Montane–Foothill Forest; Lower Montane– Foothill Grassland and Shrubland; Riverine–Riparian Forest and Shrubland; Springs and Groundwater- Dependent Wetlands; Lakes, Ponds, and Reservoirs</td>
<td>Present in wildlife analysis area based on Forest Service surveys.</td>
</tr>
<tr>
<td>Hoary Marmot</td>
<td><em>Marmota caligata</em></td>
<td>Alpine and High Montane Scrub, Grassland and Barrens</td>
<td>Potentially in wildlife analysis area based on presence of suitable habitat.</td>
</tr>
</tbody>
</table>

Source: IDFG 2017a; PNF/BNF Monitoring Data (Galloway 2019).

**Mule deer.** Mule deer are a priority species/big game species of special interest in the PNF and BNF. Mule deer are habitat generalists and have been observed frequently in and near the wildlife analysis area. There is no designated mule deer winter range in the wildlife analysis area. Mule deer are best adapted to seral, transitional habitat types.
IDFG manages and monitors mule deer at the BGMU level. Portions of the wildlife analysis area are in legal mule deer hunting units, including BGMUs 24, 25, 26, and 27. The IDFG (2018b) estimated the mule deer population in the Weiser-McCall PMU 2 (which includes BGMU 24) to be 35,269 individuals in 2010. The population estimate for the Middle Fork PMU 3 (includes BGMU 25, 26, and 27) was 10,248 individuals in 2010 (IDFG 2018b). In 2017, the estimated abundance of mule deer was 1,279 individuals in BGMU 25, 1,319 individuals in BGMU 26, and 6,007 individuals in BGMU 27 (Forest Service 2019c).

### 3.13.4.6 Migratory Bird Species, Bald and Golden Eagles

Migratory birds are protected under the MBTA, and bald and golden eagles also are protected under the BGEPA. Most of the bird species discussed in the sections above are protected by the MBTA, with the exception of the mountain quail and dusky (blue) grouse. The Idaho Partners in Flight (PIF) Idaho Bird Conservation Plan (Ritter 2000) was used to identify migratory bird species and habitats in the wildlife analysis area. The Idaho Bird Conservation Plan takes a habitat-based approach to conserving bird populations in Idaho and correlated priority bird species with four habitats of highest priority (Ritter 2000). Idaho PIF priority migratory bird species are shown in Table 3.13-9, including the high priority habitats they represent. Two of the four high priority habitats occur in the wildlife analysis area and are shown in Table 3.13-9.

#### Table 3.13-9 Migratory Bird Species and Priority Habitats in Wildlife Analysis Area

<table>
<thead>
<tr>
<th>Idaho PIF Highest Priority Habitats</th>
<th>Idaho PIF Priority Migratory Bird Species</th>
<th>Idaho PIF Priority Migratory Bird Species in Wildlife Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Ponderosa Pine / Douglas-fir / Grand Fir Forests (Aspen can occur)</td>
<td>White-headed Woodpecker; Flammulated Owl</td>
<td>White-headed Woodpecker; Flammulated Owl</td>
</tr>
<tr>
<td>Riparian</td>
<td>Barrow’s Goldeneye; Hooded Merganser; Blue Grouse; Mountain Quail; Black-chinned hummingbird; Calliope Hummingbird; Rufous Hummingbird; Willow Flycatcher; Dusky Flycatcher; Black-billed Magpie; American Dipper; Yellow Warbler; MacGillivray’s Warbler</td>
<td>Blue Grouse; Mountain Quail; Calliope Hummingbird; Willow Flycatcher; American Dipper</td>
</tr>
</tbody>
</table>


Migratory bird species known to occur in the wildlife analysis area through sightings or sign (e.g., nests, calls) include the golden eagle, Steller’s jay, gray jay, Clark’s nutcracker, common raven, and American dipper. Migratory bird species not documented, but assumed to occur due to suitable habitat, include the American robin, hermit thrush, Swainson’s thrush, varied thrush, and red-tailed hawk.

The USFWS lists bird species of conservation concern for bird conservation regions across the U.S. (2008b). These are species that have reduced populations or loss of essential habitat.
Table 3.13-10 lists these species for Region 10 of the USFWS; all also are protected under the MBTA. The species in this section include species of conservation concern other than the special status species previously described.

Six of the 17 bird species of conservation concern listed in Table 3.13-10 have a reasonable possibility of occurrence in the general wildlife analysis area: the calliope hummingbird, Lewis’s woodpecker, olive-sided flycatcher, willow flycatcher, Cassin’s finch, and Brewer’s sparrow.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Likelihood of Occurrence in the Wildlife Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brewer’s sparrow</td>
<td>Spizella breweri</td>
<td>Potential – breeding suspected&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Calliope hummingbird</td>
<td>Stellula calliope</td>
<td>Potential – breeding has occurred&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cassin’s finch</td>
<td>Carpodacus cassinii</td>
<td>Potential, habitat present, not recorded in Valley County&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lewis’s woodpecker</td>
<td>Melanerpes lewis</td>
<td>Potential – 1, habitat present, limited documentation</td>
</tr>
<tr>
<td>Olive-sided flycatcher</td>
<td>Contopus cooperi</td>
<td>Potential – habitat present, not recorded&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Willow flycatcher</td>
<td>Empidonax traillii</td>
<td>Potential – habitat present (wetlands)</td>
</tr>
<tr>
<td>Black rosy-finch</td>
<td>Leucosticte atrata</td>
<td>Low – not recorded in Valley County&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ferruginous hawk</td>
<td>Buteo regalis</td>
<td>Low – habitat is grasslands, not recorded&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Loggerhead shrike</td>
<td>Lanius ludovicianus</td>
<td>Low – not recorded in Valley County&lt;sup&gt;1&lt;/sup&gt;, no habitat</td>
</tr>
<tr>
<td>McCown’s longspur</td>
<td>Calcarius mccownii</td>
<td>Low – not recorded in Valley County&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Swainson’s hawk</td>
<td>Buteo swainsoni</td>
<td>Low – not recorded in Valley County&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Williamson’s sapsucker</td>
<td>Sphyrapicus thyroideus</td>
<td>Low – not recorded&lt;sup&gt;1&lt;/sup&gt;, habitat present</td>
</tr>
<tr>
<td>Black swift</td>
<td>Cypseloides niger</td>
<td>Negligible – no habitat (high waterfalls), not reported&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Long-billed curlew</td>
<td>Numenius americanus</td>
<td>Negligible – no habitat, no record&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sage sparrow</td>
<td>Amphispiza belli</td>
<td>Negligible – no habitat, not reported&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sage thrasher</td>
<td>Oreoscoptes montanus</td>
<td>Negligible – no habitat, not recorded&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Upland sandpiper</td>
<td>Bartramia longicauda</td>
<td>Negligible – no habitat, no record&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Source: USFWS 2021b.  
<sup>1</sup>Idaho Bird Records database (2018); other species listed in Atlas of Idaho’s Wildlife (IDFG 1997)

### 3.14 Timber Resources

#### 3.14.1 Introduction

Timber resources are the trees used to develop merchantable forest products. Forest products include timber products, such as lumber, paper, and firewood, and other “special forest products,” such as floral greenery, Christmas trees, medicinal herbs, fungi, and other natural products (Forest Service 2017e). Timber resources in the SGP area consist of conifer tree species typically harvested to make forest products, including merchantable sawtimber-sized trees and sub-merchantable small trees.
3.14.2 Timber Resources Area of Analysis

The analysis area for timber resources encompasses the area containing saleable timber resources in which disturbance from any action alternative would occur (i.e., the area proposed for direct removal of timber). The extent of the analysis area for timber resources is more focused than the entire SGP area because large portions of the SGP area do not contain timber resources. Areas lacking timber resources include areas that have experienced wildfire in the past 20 years, areas beneath the existing transmission line, and existing roads. The analysis area includes NFS, private, and state lands, and lands managed by the BOR. NFS lands in the analysis area include portions of PNF) and portions of BNF. The analysis area for timber resources is shown on Figure 3.14-1. Some timber resource information is shown to extend beyond the boundaries of the analysis area in order to provide the reader with broader context for timber resources (i.e., the extent of private and state lands in the vicinity of the analysis area).


3.14.3.1 National Forest Management Act of 1976

National Forest Management Act of 1976: The NFMA of 1976 requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the NFS. The NFMA, as amended, and its implementing regulations under 36 CFR 219, consolidate and articulate Forest Service management responsibilities for lands and resources of the NFS. The land and resource management plans developed for the PNF and BNF under NFMA and its implementing regulations, their relevant timber resource provisions, and the SGP-specific plan amendments that may be required for the SGP are summarized below.

The NFMA provides that, in developing land and resource management plans, the Forest Service is to identify lands that are not suited for timber production and assure that “except for salvage sales or sales to protect other multiple-use values, no timber harvest shall occur on such lands for a period of 10 years” (Suitability for Timber Production [16 USC 1604(k)]). NFMA and its implementing regulations include requirements to periodically re-verify the location of lands that are suited for timber production at least once every 10 years. Suited lands include forested lands outside withdrawn areas, such as designated wilderness areas, lands where reforestation can be assured, and lands where timber management activities can take place without causing irreversible resource damage to soil productivity or watershed conditions (16 USC 160). Further, the NFMA states, “it is the policy of the Congress that all forested lands in the NFS shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans” (Reforestation [16 USC 1604(d)(1)]).

Lands suited for timber removal are evaluated to determine the range of Forest Service commercial timber sale harvest levels. The quantity of sawtimber that may be sold from the lands suited for timber on a forest is expressed as Allowable Sale Quantity (ASQ), which represents the average annual maximum volume that a forest may sell during each decade. Generally, all timber sold and harvested on suited lands during a decade must be counted against the ASQ to ensure that no more timber than allowed is removed from the suited lands. ASQ is measured in board feet and is estimated during harvest.
Figure 3.14-1
Analysis Area for Timber Resources
Stibnite Gold Project
Stibnite, ID

Legend
Timber Resources
Analysis Area
Project Site
Access Routes
Offsite Facilities
Utilities
Surface Land Management
Bureau of Land Management
Bureau of Reclamation
Private
State
U.S. Forest Service
Other Features
U.S. Forest Service
County
City/Town
Monumental Summit
Railroad
Highway
Road
Stream/River
Lake/Reservoir

Land Ownership Detail within Mine Site

*Analysis Area is associated with all Alternatives

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 4.5 miles
when printed at 11x17

Figure 3.14-1
Analysis Area for Timber Resources
Stibnite Gold Project
Stibnite, ID
The Multiple Use Act of 1955 (69 Statute 367, 30 USC 612): This Act provides for more restricted
surface use rights for unpatented mining claims located in 1955 or later than those located prior to 1955.
There are no unpatented mining claims within the SGP area that predate the 1955 Act (Midas Gold
2017g). FSM 2800, Minerals and Geology, Chapter 2810 Mining Claims clarifies timber ownership rights
on unpatented mining claims. Section 2813.13b–Claims Validated Subsequent to Act of 1955: Such
claims which otherwise come under 30 USC 612 carry the same surface rights as those described in
Section 2812, except for the following modifications:

- Right to occupancy and use necessary for prospecting, mining, and processing, but not the
exclusive right to the surface. Lands containing such claims are subject to the rights of the U.S. to
manage and dispose of the vegetative resources, to manage other resources except locatable
minerals, and to the right of the U.S., its permittees and licensees, to use so much of the surface
area necessary for such purposes and for access to adjacent lands.

- Right to cut timber on the claim for mining uses and for necessary clearing, except that timber cut
in the process of necessary clearing cannot be sold by the claimant. The U.S. has the right to
dispose of timber and other vegetative resources.”

As per statutory authority provided to the Forest Service by the Multiple-use Mining Act of 1955, the
Forest Service maintains rights to timber and other vegetation resources on all unpatented claims made
after 1955. For timber harvest on these lands, the Claimant must coordinate with the Forest Timber Staff
well in advance (ideally 1.5 to 2 years before the need to have the trees/timber removed from the subject
area).

Forest Service Handbooks and Manuals: The Forest Service has regulations and policies in FSHs
(1909.60 and 2409.17) and FSMs (1920, 2430, 2470, 2471, and 2472) related to forest vegetation (Forest
Service 2018b). Cutting and removal of merchantable trees from NFS lands must be consistent with
Forest Service directives, particularly FSM 2400, FSM 2800, associated regulations (36 CFR 223.9, 36
CFR 223.14), and FSHs (2409.17 and 2409.26), both of which detail silvicultural activities permitted on
government-owned land in the NFS.

Idaho Forest Practices Act: Administered by the IDL, this Act was enacted in 1974 to promote active
forest management and ensure that the health of forest soil, water, vegetation, wildlife, and aquatic habitat
is maintained during the growing and harvesting of forest trees in Idaho. The Idaho Forest Practices Act
requires forest practices rules for state and private lands to protect, maintain, and enhance natural
resources. To deliver timber to a mill, a timber harvest must file a “notification of Compliance” with the
IDL, indicating an intention to follow the rules pertaining to the Idaho Forest Practices Act and follow fire
hazard prevention measures of the IDAPA/Idaho Administrative Code 20.02.01. Notable rules include
requirements related to restocking, stream protection, logging operations, and soil protection (IDL 2018).

The Idaho Mined Land Reclamation Act (1971): The IDL also administers the Idaho Mined Land
Reclamation Act, which requires reclamation of affected lands to a productive condition, including both
lands affected by surface mining and the surface effects of underground mining. Incorporated into state
statute under Title 47 “Mines and Mining,” Chapter 15 “Mined Land Reclamation,” the law includes
procedures for reclamation that include plugging drill holes, and cross-ditching abandoned roads to avoid
erosion (Section 47-1509); and for vegetation planting that specify an operator shall plant vegetation species on affected lands “that can be expected to result in vegetation comparable to the vegetation that was growing on the area occupied by the affected lands prior to exploration and mine operations” (Section 47-1510) (IDL 2019).

The Valley County Comprehensive Plan: This comprehensive plan includes goals and objectives for the management and use of resources in Valley County, including natural resources such as timber. Goal I for “Economic Development” is “to promote and encourage activities which will maintain a strong, diversified economy.” Objectives under this Goal include “maintain the important role of the timber industry, tourism, outdoor recreation, mining and agriculture in the local economy and “Support ‘multiple use’ of public lands.” Goal IV for Natural Resources is “to maintain sustainable commercial harvesting and use of renewable timber land resources.” Goal V for Natural Resources is “to assure mining remains a viable element in Valley County’s economy.” Timber receipts as a source of revenue for the county has ceased and declines in the timber industry have created a hardship for the county as timber receipts played an important role in funding county schools and roads (Valley County 2018a).

The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for timber and include various objectives, guidelines, and standards for this purpose. To achieve the desired outcomes and conditions for both land stewardship and public service (i.e., desired conditions), the forest plans include management standards for timber resources at three scales: forest-wide level, more specific and focused MA level, and MPC level.

Generally, the desired conditions for timber resources are conditions in which a forest meets its timber sale program ASQ goals while managing lands suited for timber harvest in conformance with forest plan goals and strategies. Both forest plans evaluate available forestland within their respective boundaries to determine suitability for timber production and reflect the results of that evaluation by demarcating MPCs that allow timber harvest within areas containing suited acres. Despite the presence of timber species, if land is determined to be physically unsuited for timber production because of the inability to ensure adequate restocking or the potential for irreversible damage to soils or watersheds, timber production is removed as an intended use of that land. However, some exceptions for the removal of timber resources on unsuited lands are explicitly noted. In PNF MA 13, MPCs 3.1, 3.2, and 4.1c are identified as not suited for timber production; however, the Payette Forest Plan states that on these lands forest vegetation management actions, which include removal of timber resources, may be undertaken to “support the achievement of desired conditions or other resource objectives” consistent with the management goals laid out for them (Forest Service 2003a).

3.14.4 Affected Environment

Timberland vegetation in central Idaho is dynamic, with changes occurring through both natural processes and timber management practices, and therefore the distribution and composition of timber resources also are dynamic. Natural disturbance processes include fires, windstorms, landslides, and insect and disease outbreaks. Management of timber forest vegetation includes timber harvest, planting, thinning, and other timber stand improvement activities, as well as prescribed burning. This section describes the existing conditions for timber resources in the analysis area, including timber and special forest products. This
summary is based on best available vegetation and timber ownership information from the Forest Service and USGS as of August 2019.

### 3.14.4.1 Timber Vegetation

As described in **Section 3.10**, the Forest Service maps existing vegetation communities and updates their maps periodically; however, these data are only available for NFS land. The existing Forest Service vegetation mapping system, VCMQI, reflects the forest-specific dominance type phases found on NFS land and was used to describe seral-stage timber resource composition in forested areas on NFS lands in the analysis area.

Private, state, and other federal lands in the analysis area, that are outside the boundaries of the PNF or BNF, are not characterized by Forest Service vegetation mapping, and therefore timber vegetation conditions were extrapolated from publicly available datasets and aerial imagery (Perpetua 2021a).

Existing vegetation communities in the analysis area include many developed and natural communities that generally are divided into broad lifeform-type categories. Fires, both natural and man-caused, have frequently occurred in the analysis area and surrounding forests, and much of the analysis area is currently mapped as burned herbaceous (grasses and forbs), burned sparsely vegetated, and burned forest shrubland. The lifeform type “Coniferous Forest” is defined as being dominated by conifer species and includes all the vegetation types that are dominated by timber species. In general, the existing Coniferous Forest vegetation communities are those typical of high mountain regions in Idaho and the inland northwestern U.S. The most common unburned, existing Coniferous Forest vegetation dominance types in the analysis area, which are used as a proxy for timberland vegetation in the absence of timber-specific mapping, are lodgepole pine forests, subalpine fir forests, Douglas-fir forests, Ponderosa pine forests, and Engelmann spruce forests (Forest Service 2014b, 2014c, 2016b, 2017b).

Timberland vegetation communities in and immediately adjacent to the analysis area are shown in **Figures 3.14-2a through 3.14-2d**. Although timber outside of the analysis area would not be affected by SGP activities, it is shown to provide a larger, landscape-wide context.

### 3.14.4.2 Timber Resources

Many conifer tree species that are commonly harvested for commercial use are found in the analysis area. Coniferous Forest communities dominated by these species, either in monotypic (single species) stands or multi-species stands, are considered to contain timber resources. Timber resources (both sawtimber and other tree-based forest products) include materials used to develop timber products as well as “special forest products.” Timber resources in the analysis area are derived from trees traditionally used for forest products and include the following merchantable species of conifers:

- Douglas-fir
- Engelmann spruce
- Lodgepole pine
- Ponderosa pine
The above list excludes pinyon, limber pine, juniper, and whitebark pine (federally proposed as a threatened species) because they typically are not harvested for sale in the PNF or BNF (Witt et al. 2012), and vegetation communities dominated by these species are not included in the analysis area. However, in the event individuals of these species or other non-timber conifer species are encountered during SGP implementation they would be processed as timber species and included in merchantable volumes.

Special forest products, which are derived from sub-merchantable trees, sold from the PNF and BNF include Christmas trees, transplants (e.g., trees, shrubs, or herbaceous plants), fuelwood, and posts and poles (Forest Service 2017e). Special forest products also are called non-convertible products because they are products that are not converted into board foot or cubic foot measure. The analysis area contains a mix of sawtimber and sub-merchantable trees, and while sawtimber is reported in volume of wood as well as acres within the analysis area, sub-merchantable trees or “special forest products” are reported in terms of the acres they occupy.

### 3.14.4.3 Timber Extent

To determine the extent of timber resources in the analysis area, existing spatial vegetation mapping data from various sources, were combined to create a single consistent coverage in GIS. Data used to determine the extent of timber resources were collected from a variety of sources, including existing vegetation geographic information system data from the PNF and BNF (Forest Service 2016b, 2017b), publicly available LANDFIRE vegetation classification data (USGS 2016a), land ownership data managed by the Bureau of Land Management (BLM) (2017), management prescription boundaries from the PNF and BNF, and mine claim data provided by Midas Gold. Once the vegetation community coverage dataset was complete, the subset of the data containing conifer-dominant vegetation communities was extracted, because it represents the potential timber resources in the analysis area. Areas that do not support timber resources—either because the timber was recently removed (i.e., burned in a fire within the last 20 years) or not realistically present (i.e., within existing roads and within the existing transmission line corridor) were then removed from the potential timber resources layer. The result provides the basis of the estimates of timber extent in the analysis area.
Figure 3.14-2a  Timber Resources in the Vicinity of the Analysis Area
Stibnite Gold Project
Stibnite, ID

Timber Resources
- Douglas Fir
- Douglas Fir/Lodgepole
- Engelmann Spruce
- Grand Fir/Ponderosa
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Grand Fir Mix
- Western Larch
- Non-Timber Vegetation Communities

LEGEND
- Burned Area (2000-2015)**
- Project Area
- Project Site
- Access Routes, Johnson Creek
- Access Routes, Burntlog Route
- Utilities
- Existing Access Road, Burntlog Route
- Utilities
- New Substation
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
  - Road
  - Stream/River
  - Lake/Reservoir

Burned areas are excluded from the Timber analysis area.
Figure 3.14-2b
Timber Resources in the Vicinity of the Analysis Area
Stibnite Gold Project
Stibnite, ID

LEGEND
- Burned Area (2000-2015)**
- Project Area, Alternative
- Access Routes, Johnson Creek
- Access Routes, Burntlog Route
- Utilities
  - New Substation
  - Existing Substation
- Offsite Facilities
  - Burntlog Maintenance Facility
  - Landmark Maintenance Facility
- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Road
  - Stream/River
  - Lake/Reservoir

Timber Resources
- Douglas Fir
- Douglas Fir/Lodgepole
- Engelmann Spruce
- Grand Fir/Ponderosa
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Grand Fir Mix
- Western Larch
- Non-Timber Vegetation Communities

**Burned areas are excluded from the Timber analysis area.
Figure 3.14-2c
Timber Resources in the Vicinity of the Analysis Area
Stibnite Gold Project
Stibnite, ID

LEGEND
- Burned Area (2000-2015)**
  - Project Area, Alternative
- Access Routes, Johnson Creek
- Access Routes, Burntlog Route
- Utilities
- New Substation
- Existing Substation
- Offsite Facilities
  - Stibnite Gold Logistics Facility

Other Features
- U.S. Forest Service
- County
- City/Town
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

Timber Resources
- Douglas Fir
- Douglas Fir/Lodgepole
- Englemann Spruce
- Grand Fir/Ponderosa
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Grand Fir Mix
- Western Larch
- Non-Timber Vegetation Communities

**Burned areas are excluded from the Timber Analysis Area.
Figure 3.14-2d
Timber Resources in the Vicinity of the Analysis Area
Stibnite Gold Project
Stibnite, ID

Timber Resources
- Douglas Fir
- Douglas Fir/Lodgepole
- Engelmann Spruce
- Grand Fir/Ponderosa
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Grand Fir Mix
- Western Larch
- Non-Timber Vegetation Communities

Burned areas are excluded from the Timber analysis area.

LEGEND
Project Area, Alternative
Utilities
Utilities
existing Substation
Other Features
U.S. Forest Service
City/Town
Railroad
Highway
Road
Lake/Reservoir

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest; Payette County

1 inch = 1.75 miles when printed at 11x17

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3.14.4.4 Timber Ownership

Timber resource ownership varies across the analysis area and determines the standards used to manage timber resources. Timber resources in the analysis area are found on land managed by the Forest Service, privately owned land, state-owned land, and land managed by the BOR (BLM 2017; Forest Service 2016b) (Table 3.14-1). NFS land in the analysis area includes unclaimed areas and unpatented claims, both of which contain timber resources. Timber on unclaimed areas and unpatented claims within NFS land is managed by the Forest Service subject to applicable claimant rights associated with unpatented claims. Timber on patented claims is considered “private,” like timber on other private lands in the analysis area. Timber that is managed by the Forest Service is subject to applicable Forest Service management directives, while private timber is not. Privately owned timber is subject to guidelines set by the State of Idaho as well as Valley County. Timber on state lands follow guidelines set by the State of Idaho for timber utilization.

Table 3.14-1 Timber Resource Ownership and Mining Claim Status Across the Analysis Area

<table>
<thead>
<tr>
<th>Underlying Land Ownership (Manager)</th>
<th>Mining Claim Status(^1)</th>
<th>Acres of Timber Resources(^2)</th>
<th>Percent of the Analysis Area(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (BNF) Unpatented</td>
<td></td>
<td>10.9</td>
<td>1</td>
</tr>
<tr>
<td>Public (BNF) Unclaimed</td>
<td></td>
<td>520.3</td>
<td>61</td>
</tr>
<tr>
<td>Public (PNF) Unpatented</td>
<td></td>
<td>158.0</td>
<td>18</td>
</tr>
<tr>
<td>Public (PNF) Unclaimed</td>
<td></td>
<td>11.9</td>
<td>1</td>
</tr>
<tr>
<td>Public (SCNF) Unpatented</td>
<td></td>
<td>0.2</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Public (Forest Service) (Total)</td>
<td></td>
<td>701.3</td>
<td>82</td>
</tr>
<tr>
<td>Private Patented</td>
<td></td>
<td>35.3</td>
<td>4</td>
</tr>
<tr>
<td>Private Unclaimed</td>
<td></td>
<td>68.7</td>
<td>8</td>
</tr>
<tr>
<td>Private (Total)</td>
<td></td>
<td>104.0</td>
<td>12</td>
</tr>
<tr>
<td>State of Idaho Unclaimed</td>
<td></td>
<td>49.8</td>
<td>6</td>
</tr>
<tr>
<td>State of Idaho (Total)</td>
<td></td>
<td>49.8</td>
<td>6</td>
</tr>
<tr>
<td>(ALL land Management)</td>
<td>Grand Total</td>
<td>855.1</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Forest Service 2003a, 2010a; Perpetua 2021a.

\(^1\)“Patented” refers to timber on patented claims, which is privately owned by the claimant; “unpatented” refers to unpatented claims. According to information provided by Midas Gold all of the SGP claims in the analysis area were staked after 1955 (Midas Gold 2017g) and therefore all timber on these lands is managed by the surface land management agency (not by the claimant); “Unclaimed” refers to acreage lacking claim information in the available data, and it is assumed to contain timber that is managed by the surface land management agency/owner.

\(^2\)Acres are based on the timber resources (excluding burned areas) in the analysis area, which consists of the combined footprints of the 2021 MMP and Johnson Creek Route Alternative.

\(^3\)“Percent of the Analysis Area” represents the portion of the analysis area covered by different land management entities and mining claim distinctions, calculated as a percent of the extent of the entire analysis area.
Forest Service Timber

On NFS lands, Forest Service commercial timber sale program harvest levels are set geographically and reported in volume (reported in thousand board feet [MBF]) of sawtimber allowed to be harvested for sale (Forest Service 2012b). Forest Plan direction for the forest wide ASQ, wood product extraction goals, and Total Sale Program Quantity (TSPQ) also are reported in MBF (Table 3.14-2). The Payette and Boise Forest Plans do not provide direction for an ASQ of special forest products on NFS lands. However, because areas occupied by sub-merchantable timber resources are considered timberland vegetation, the removal of sub-merchantable timber constitutes a removal of timberland resource area from future production.

Table 3.14-2  Timber Harvest Goals from Payette and Boise Forest Plans

<table>
<thead>
<tr>
<th>Timber Harvest Goal Metrics</th>
<th>Payette Forest Plan¹</th>
<th>Boise Forest Plan²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Suited Timberlands, Forest Wide</td>
<td>330,000 acres</td>
<td>527,500 acres</td>
</tr>
<tr>
<td>ASQ</td>
<td>32,500 MBF</td>
<td>28,200 MBF</td>
</tr>
<tr>
<td>Wood Product Extraction Goal</td>
<td>7,800 MBF</td>
<td>11,500 MBF</td>
</tr>
<tr>
<td>TSPQ</td>
<td>40,300 MBF</td>
<td>39,700 MBF</td>
</tr>
</tbody>
</table>

¹ROD for the FEIS and Revised Land and Resource Management Plan (Revised Plan). McCall, ID. Table II-2, page II-30. (Forest Service 2003a).
²Boise Forest Plan 2003-2010 Integration. Lowman, ID. Table II-2, page II-31. (Forest Service 2010a).

As described in Section 3.14.3.1, the Payette Forest Plan and Boise Forest Plan divide their lands into MAs, which are further subdivided geographically to account for different intended uses of different landscape areas. The subdivisions, or MPCs, specify the intended uses of a landscape unit, including whether timber harvest is an allowable use. If timber harvest is intended in an MPC, the unit will include “suited timberland” acreage (Table 3.14-3). Timber vegetation in the analysis area is found in one MA in the PNF: MA 13–Big Creek/Stibnite; and four MAs in the BNF: MA 17–North Fork Payette, MA 19–Warm Lake, MA 20–Upper Johnson Creek, and MA 21–Lower Johnson Creek. In the PNF, timber resources in the analysis area fall into two MPCs, neither of which include timber harvest as an intended use: MPC 3.1–Passive Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources; and MPC 3.2–Active Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources. In the BNF, timber resources in the analysis area fall within portions of MPCs 3.1 and 3.2, as well as MPC 4.2–Roaded Recreation Emphasis, and MPC 5.1–Restoration and Maintenance Emphasis in Forested Landscape. MPCs 5.1 and 4.2 in the BNF contain suited timberlands; therefore, timber removal and sale are allowed under special conditions and may contribute towards the ASQ for the BNF. MPCs 3.1 and 3.2 in the BNF do not contain suited timberlands. Timber resources in the portion of the analysis area containing suited timberlands (MPC 5.1 and MPC 4.2) are shown in Figures 3.14-3a-c.
Timber Resources in Analysis Area:
- Douglas Fir
- Douglas Fir/Lodgepole
- Grand Fir/Ponderosa
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Non-Timber Vegetation Communities

Tree Size Class in Analysis Area:
- TS5: Large Tree Size: 20-29.9" DBH
- TS4: Medium Tree Size: 10-19.9" DBH
- TS3: Small Tree Size: 5-9.9" DBH
- TS2: Sapling Tree Size: 0.1-4.9" DBH
- NS: No Tree Size Class

Legend
- USFS Management Prescription
- Boise National Forest
- U.S. Forest Service
- Forest Service Management Area
- County
- City/Town
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir
- Surface Land Management
- Bureau of Land Management
- Private
- State
- U.S. Forest Service

Surface Map Location
- Valley County, ID

Figure 3.14-3a
Timber Resources in BOI 17 MPC 5.1
Stibnite Gold Project
Stibnite, ID

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho; Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

*Analysis Area is associated with all Alternatives.
Figure 3.14-3b
Timber Resources in BOI MA 19 MPC 4.2
Stibnite Gold Project
Stibnite, ID

Tree Size Class in Analysis Area*

- TS5: Large Tree Size: 20-29.9" DBH
- TS4: Medium Tree Size: 10-19.9" DBH
- TS3: Small Tree Size: 5-9.9" DBH
- TS2: Sapling Tree Size: 0.1-4.9" DBH
- NS: No Tree Size Class

Legend
USFS Management Prescription
- Boise National Forest

Other Features
- U.S. Forest Service
- Forest Service Management Area

County
- City/Town
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

Surface Management Agency
- Private
- U.S. Forest Service

*Analysis Area is associated with all Alternatives
**Burned areas are excluded from the Timber Analysis Area

Map Location
Valley County, ID

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

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Timber Resources in Analysis Area*

- Douglas Fir
- Douglas Fir/Lodgepole
- Engelmann Spruce
- Lodgepole Pine
- Ponderosa Pine
- Subalpine Fir Mix
- Non-Timber Vegetation Communities

Burned Area (2000-2015)**

Tree Size Class in Analysis Area:
- TS5: Large Tree Size: 20-29.9" DBH
- TS4: Medium Tree Size: 10-19.9" DBH
- TS3: Small Tree Size: 5-9.9" DBH
- TS2: Sapling Tree Size: 0.1-4.9" DBH
- TS1: Seedling Tree Size: <4.5' Tall
- NS: No Tree Size Class

Legend
- USFS Management Prescription
  - Boise National Forest
  - Payette National Forest
- Other Features
  - U.S. Forest Service Forest Service Management Area
  - County
  - City/Town
  - Railroad
  - Highway
  - Road
  - Stream/River
  - Lake/Reservoir
- Surface Management Agency
  - Private
  - U.S. Forest Service

*Analysis Area is associated with all Alternatives
**Burned areas are excluded from the Timber Analysis Area

Boise National Forest
Payette National Forest

Figure 3.14-3c
Timber Resources in BOI MA 21 MPC 5.1
Stibnite Gold Project
Stibnite, ID

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho
Legend

Map Location

Boise National Forest
Payette National Forest
Survival Management Agency
Private
U.S. Forest Service
Table 3.14-3  Timber Vegetation on Forest Service Management Areas by Management Prescription Code

<table>
<thead>
<tr>
<th>Forest Plan MPC</th>
<th>Acres Designated as Suited for Timber Production¹</th>
<th>Approximate Acres of Timber Vegetation per MPC²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNF 13-Big Creek-Stibnite (3.1)</td>
<td>0</td>
<td>17,553.23</td>
</tr>
<tr>
<td>PNF 13-Big Creek-Stibnite (3.2)</td>
<td>0</td>
<td>11,125.54</td>
</tr>
<tr>
<td>Total PNF</td>
<td>0</td>
<td>28,678.77</td>
</tr>
<tr>
<td>BNF 17-North Fork Payette River (5.1)</td>
<td>34,300</td>
<td>5,263.92</td>
</tr>
<tr>
<td>BNF 19-Warm Lake (3.2)</td>
<td>0</td>
<td>25,729.38</td>
</tr>
<tr>
<td>BNF 19-Warm Lake (4.2)</td>
<td>4,800</td>
<td>2,140.24</td>
</tr>
<tr>
<td>BNF 20-Upper Johnson Creek (3.1)</td>
<td>0</td>
<td>31,424.22</td>
</tr>
<tr>
<td>BNF 20-Upper Johnson Creek (3.2)</td>
<td>0</td>
<td>15,648.11</td>
</tr>
<tr>
<td>BNF 21-Lower Johnson Creek (3.2)</td>
<td>0</td>
<td>11,093.05</td>
</tr>
<tr>
<td>BNF 21-Lower Johnson Creek (5.1)</td>
<td>16,000</td>
<td>14,533.29</td>
</tr>
<tr>
<td>Total BNF</td>
<td>55,100</td>
<td>105,832.21</td>
</tr>
</tbody>
</table>

¹Acres designated as suited for timber production are based on reported acreages in the Payette Forest Plan and Boise Forest Plan.
²Acres of timber vegetation in the Management Areas are based upon vegetation mapping provided by the PNF and the BNF.

State, Other Federal, and Private Timber

Unlike Forest Service timber resources, there is no NFMA land and resource management plan guiding the location and amount of timber resources intended to be harvested from the remainder of the analysis area. The State of Idaho Forest Practices Act, which would guide timber harvest from commercial timberlands on the other federal, state-owned, and private portions of the analysis area, sets requirements for timber harvest planning, harvest operation, and reporting only (IDL 2018). The extent or presence of commercial timberlands in these other areas of the analysis area is not readily available information, and not considered significant or necessary for the analysis of the effects of the SGP.

3.15  Land Use and Land Management

3.15.1  Introduction

The analysis area for land use and land management includes the combined footprint of all potential components for the SGP including the Operations Area Boundary, the access routes, transmission line infrastructure, and off-site facilities. The analysis area and land status are shown in Figure 3.15-1. The SGP primarily consists of NFS lands on the PNF and the BNF with some private, state, and BOR lands also included. Land use in the analysis area consists of mining uses, utilities, roads, agriculture, residential, fisheries, timber, tribal, recreational, and special uses. The discussion of existing conditions provides a land use context for the collective SGP area that could be impacted by the action alternatives.
3.15.2 Land Use and Land Management Area of Analysis

The analysis area for land use and land management includes the combined footprint of all potential components for the SGP, including Operations Area Boundary, access and haul roads (proposed and existing), utility infrastructure (proposed and upgraded), and off-site facilities (Figure 2.4-1).

3.15.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to land use and management for the Proposed Action and Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to Land Use and Land Management.

1872 Mining Law (as amended): Statutory right to search for, develop, and extract mineral deposits on federal land open to mineral entry. 30 U.S.C. 22 et seq.

Organic Administration Act of 1897: Authorizes the establishment of National Forest Reserves to improve and protect the condition of forested areas of the U.S., and to provide a continuous supply of timber for the use and necessities of the public. The Act provides for lands that have been open for mineral entry and location under the mining laws to remain subject to such entry and location. 16 U.S.C. 473-475, 477-482, 551.

Mining and Minerals Policy Act: Established a national mining and minerals policy which confirms the national interest to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources.

Multiple Use Act of 1955: Mining claims patented prior to 1955 provide the owner the rights under FSM 2800. 30 U.S.C. 612.


Bureau of Reclamation: A use authorization is required in accordance with 43 CFR 429.3 for certain uses or activities on BOR land. The BOR is responsible for authorizing or modifying the transmission line ROW on their lands.

Wild and Scenic Rivers Act: Preserves certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition.

National Environmental Policy Act of 1969: Requires federal agencies to analyze the expected environmental impacts of the agency’s Proposed Action.

Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a): Provide management prescriptions designed to realize goals for achieving desired condition for geologic resources and geotechnical hazards and include various objectives, guidelines, and standards for this purpose. All uses of NFS lands, improvements, and resources, except those provided for in the regulations governing
the sale and disposal of timber and other forest products (36 CFR 223), minerals (36 CFR 228), and range management, including the grazing of livestock (36 CFR 222), are designated “special uses” and must be approved by an authorized officer (Title 36 CFR 251.50[a]).

Revised Statute 2477: The public ROW on federal lands is administered per Revised Statute 2477. Revised Statute 2477 public ROWs are under the jurisdiction of Valley County. Though Revised Statute 2477 easements in the SGP area have been asserted by Valley County, none have been adjudicated.

Idaho Roadless Rule: Established federal management direction for designated Roadless Areas in the State of Idaho to protect their important characteristics. Locatable mining activities are not affected by the Rule. 36 C.F.R. 294 Subpart C; 36 C.F.R. 294.25(b).

Idaho Mined Land Reclamation Act: Surface and underground mining of minerals for ultimate or immediate sale, in either the natural or processed state, must have an approved reclamation plan. I.C. § 47-1501.


Valley County Comprehensive Plan: Aims to ensure mining remains a viable element in Valley County’s economy and to promote and encourage activities that will maintain a strong and diversified economy through maintaining the important role of the local timber industry, tourism, outdoor recreation, mining, and agriculture (Valley County 2018a). Per Valley County Code Table 3-A, Section 9-3-1(6)(c)(1), mineral extraction regulated by state or federal agencies is identified as a permitted industrial use. Other uses subject to a conditional use permit that could pertain to the SGP include extractive industry uses; public utility supply, transfer, ore relay facilities including administration; and warehousing of equipment and products. Valley County Code Section 9-5A-2 identifies standards for roads and driveways, specifying public roads to be designed and constructed in accordance with Title 10 of the Valley County Code and in accordance with “Construction Specifications and Standards for Roads and Streets in Valley County, Idaho” (Valley County 2018a).

City of Cascade Comprehensive Plan: Provides goals, objectives, and action items pertaining to land uses in the “area of city impact.” Goals and objectives to support development of energy services could be applicable to improvements in the existing transmission line corridor and/or widening of the ROW (City of Cascade 2018).

City of Donnelly Comprehensive Plan: Describes the desired future land use classifications, including zoning, in the “area of city impact.” Objectives and policies to support development of energy services could be applicable to improvements in the existing transmission line corridor and/or widening of the ROW (City of Donnelly 2011).

The Payette Lakes Supervisory Area of the Idaho Department of Lands: Has jurisdictional authority over exploration- and mining-related activities in its administrative area (IDAPA 20.03.02).
State Endowment Lands: The existing transmission line is authorized to IPCo, and a portion of this ROW intersects State Endowment Lands. The IDL is responsible for granting or modifying the transmission line ROW on state-owned lands, if required.

3.15.4 Affected Environment

This section discusses land use and land management specific to the analysis area. Existing land use and land management, including existing access roads, utilities, and off-site facilities, are shown in Figure 3.15-1.

3.15.4.1 Land Ownership and Status

The SGP is composed of lands administered by the Forest Service (the PNF Krassel Ranger District and BNF Cascade Ranger District), the State of Idaho, BOR, and private lands. Table 3.15-1 summarizes land ownership in the SGP area for all acres affected by each of the alternatives.

<table>
<thead>
<tr>
<th>Land Ownership</th>
<th>2021 MMP Acres</th>
<th>Percent of 2021 MMP SGP Area</th>
<th>Johnson Creek Route Alternative Acres</th>
<th>Percent of Johnson Creek Route Alternative SGP Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>819.4</td>
<td>25</td>
<td>828.1</td>
<td>27</td>
</tr>
<tr>
<td>State</td>
<td>62.1</td>
<td>2</td>
<td>62.1</td>
<td>2</td>
</tr>
<tr>
<td>Boise National Forest</td>
<td>933.2</td>
<td>29</td>
<td>820.3</td>
<td>27</td>
</tr>
<tr>
<td>Payette National Forest 1</td>
<td>1,438.7</td>
<td>44</td>
<td>1,372.2</td>
<td>44</td>
</tr>
<tr>
<td>Bureau of Reclamation</td>
<td>12.5</td>
<td>&lt;1</td>
<td>12.5</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Total2</td>
<td>3,265.9</td>
<td>100</td>
<td>3,095.2</td>
<td>100</td>
</tr>
</tbody>
</table>

1 Approximately 14 acres of land listed under the PNF is administered by the PNF but is within the boundary of the Salmon-Challis National Forest. Does not account for 67 acres of temporary surface exploration pads and roads on Payette National Forest (see Chapter 2 acreage tables).
2 Subtotals may not add to totals due to rounding.

Patented and Unpatented Mining Claims

The analysis area includes both patented and unpatented mining claims in the PNF Krassel Ranger District and the BNF Cascade Ranger District. Affiliates of Perpetua own or control patented and unpatented mill site and lode claims in the Operations Area Boundary (Table 3.15-2). No land ownership has been conveyed for unpatented claims (Forest Service 2013a). Affiliates of Perpetua own the patented claims in the Operations Area Boundary except for approximately 21 acres of patented Cinnabar Claims for which Perpetua holds an option.
Figure 3.15-1
Project Area and Land Status
Stibnite Gold Project
Stibnite, ID

*Project Components are associated with all Action Alternatives.

Legend
Project Components:
- Analysis Area
- Operations Area Boundary
- Management Areas
- Research Natural Areas
- USFS Management Area
- Management Prescriptions

Other Features:
- U.S. Forest Service
- Patented Mining Claims
- Unpatented Claims
- Wilderness
- County
- City/Town
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

Surface Land Management:
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- U.S. Forest Service

Base Layer: USGS Shaded Relief Service

Other Data Sources: Midas Gold; State of Idaho

Other Data Sources: Game & Fish; USGS; Midas Gold

Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest; Idaho Department of Game & Fish; U.SGIS; Midas Gold

Figure 3.15-1
Project Area and Land Status
Stibnite Gold Project
Stibnite, ID

*Project Components are associated with all Action Alternatives.

Legend
Project Components:
- Analysis Area
- Operations Area Boundary
- Management Areas
- Research Natural Areas
- USFS Management Area
- Management Prescriptions

Other Features:
- U.S. Forest Service
- Patented Mining Claims
- Unpatented Claims
- Wilderness
- County
- City/Town
- Railroad
- Highway
- Road
- Stream/River
- Lake/Reservoir

Surface Land Management:
- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- U.S. Forest Service

Base Layer: USGS Shaded Relief Service

Other Data Sources: Midas Gold; State of Idaho

Other Data Sources: Game & Fish; USGS; Midas Gold

Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest; Idaho Department of Game & Fish; U.SGIS; Midas Gold
The Forest Service oversees mineral activities (e.g., exploration and mining) on the surface of unpatented mining claims. The Payette Lakes Supervisory Area office of the IDL has administrative jurisdiction on mining activities on patented mining claims within the Operations Area Boundary.

### Table 3.15-2 Patented and Unpatented Mining Claims in the Operations Area Boundary

<table>
<thead>
<tr>
<th>Mining Claims</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patented Claims (Acres)</td>
<td>777.1</td>
</tr>
<tr>
<td>% Patented Claims</td>
<td>5%</td>
</tr>
<tr>
<td>Unpatented Claims (Acres)</td>
<td>13,437.2</td>
</tr>
<tr>
<td>% Unpatented Claims</td>
<td>95%</td>
</tr>
<tr>
<td>Unclassified (Acres)</td>
<td>6.4</td>
</tr>
<tr>
<td>Total Claims Area (Acres)</td>
<td>14,220.8</td>
</tr>
</tbody>
</table>

1 Subtotals may not add to totals due to rounding.

#### 3.15.4.2 Land Use

**Operations Area Boundary**

The proposed Operations Area Boundary contains approximately 14,221 acres (Table 3.15-3). Within the Operations Area Boundary, there are 1,418 acres of existing disturbance, located on private (458 acres), state (36 acres), and Forest Service (915 acres) land. The mine site currently contains pits, tailings, and development rock storage facilities from previous mining activities. Mining has occurred in three general locations: Hangar Flats, Yellow Pine, and West End, with additional areas of mining-related disturbance occurring throughout the Operations Area Boundary; however, prior to Perpetua acquiring and consolidating the patented mining claims, mine operations had ceased. Intermittent restoration activities have taken place in the past as funding became available to the Forest Service. EPA, Forest Service, IDL, and IDEQ have funded remediation activities at the mine site (Section 3.7).

### Table 3.15-3 Operations Area Boundary Land Ownership

<table>
<thead>
<tr>
<th>Entity</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNF</td>
<td>8.6</td>
</tr>
<tr>
<td>PNF</td>
<td>13,432.7¹</td>
</tr>
<tr>
<td>Private</td>
<td>779.5</td>
</tr>
<tr>
<td>Total</td>
<td>14,220.8</td>
</tr>
</tbody>
</table>

1 Approximately 22.5 acres of land listed under the PNF is administered by the PNF but is within the boundary of the Salmon-Challis National Forest.
Access Roads

There are three existing primary access routes to the Operations Area Boundary from Cascade or McCall: Johnson Creek, Lick Creek, and SFSR routes (Section 3.16). The Lick Creek Route and SFSR route would not be utilized by the SGP so are not discussed further here. Within the analysis area, the Johnson Creek Route and Burntlog Route would both utilize Warm Lake Road from SH 55. The road starts in Cascade at an intersection with SH 55 and continues eastward for approximately 35 miles, ending at Johnson Creek Road (CR 10-413) at Landmark. The Johnson Creek Route is the only existing access route located in the SGP analysis area and includes Johnson Creek Road (CR 10-413) and the Stibnite Road. Johnson Creek Road is approximately 25 miles long, and the Stibnite Road is another 14 miles between the village of Yellow Pine and the mine site. Burnt Log Road (FR 447) is an existing 20-mile road in the SGP area; however, it does not currently provide access to the Operations Area Boundary. The proposed Burntlog Route corridor includes the existing Burnt Log Road and undeveloped lands where the route would connect with Meadow Creek Lookout Road (FR 51290) and Thunder Mountain Road.

Utilities

The IPCo operates approximately 64 miles of existing transmission lines, including a 42-mile, 69-kilovolt electric transmission line, and a 21.5-mile, 12.5-kilovolt electric transmission line. IPCo operates existing electrical substations located at Oxbow Dam, Horseflat, Scott Valley, McCall, Lake Fork, Warm Lake, and Thunderbolt Tap.

Existing communication facilities include a microwave relay tower installed by Midas Gold Idaho, Inc. in 2013, located on private land atop Cinnabar Peak, a 9,000-foot peak east of the SGP.

Off-Site Facilities

There are no existing off-site facilities associated with the SGP within the analysis area. Perpetua currently maintains an administrative office in Donnelly, and a core logging and storage facility in Cascade.

Rights-of-Way And Easements

There are approximately 140 acres of existing road ROW and 493 acres of existing transmission line ROW, totaling approximately 633 acres of existing ROW in the SGP area (Table 3.15-4).

Current roads in the analysis area include Cabin Creek Road (FR 467), Warm Lake Road (CR 10-579), Johnson Creek Road (CR 10-413), Stibnite Road (CR 50-412), numerous other forest roads, and the existing transmission line access roads. The existing transmission line ROW crosses private lands, as well as lands administered by the BNF, the PNF, Bureau of Reclamation, and the IDL. Components of the SGP would intersect with numerous easements for road access, including a FRTA easement along the Johnson Creek Route. There is an additional easement for approximately one mile of an abandoned railroad that is adjacent to SH 55 between Cascade and Donnelly.
### Table 3.15-4 Acres of Existing Transmission Line ROWs in the Analysis Area

<table>
<thead>
<tr>
<th>Land Management/Ownership</th>
<th>Existing Transmission Line ROW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>184</td>
</tr>
<tr>
<td>% Private</td>
<td>37%</td>
</tr>
<tr>
<td>State</td>
<td>24</td>
</tr>
<tr>
<td>% State</td>
<td>5%</td>
</tr>
<tr>
<td>NFS</td>
<td>275</td>
</tr>
<tr>
<td>% NFS</td>
<td>56%</td>
</tr>
<tr>
<td>BOR</td>
<td>10</td>
</tr>
<tr>
<td>% BOR</td>
<td>2%</td>
</tr>
<tr>
<td>**Total Area (Acres)**12</td>
<td><strong>493</strong></td>
</tr>
</tbody>
</table>

1 The analysis area for land use and land management includes the combined footprint of all proposed action alternative components for the SGP area. Alternative components include the proposed SGP, all associated mine support infrastructure, all access and haul roads (proposed and existing), all utility infrastructure (proposed and upgraded), and proposed off-site facilities.

2 Subtotals may not add to totals due to rounding.

### Other Land Uses

#### Agriculture

In Valley County, agricultural land uses are challenging due to a limited growing season, soil conditions, high water table, and occasional summer frosting. According to the 2017 Census of Agriculture, in Valley County 75 percent of farms were pastureland for livestock, 14 percent were woodland, 8 percent were cropland, and 3 percent other (USDA 2017). Agricultural lands offer potential for subdivision and second-home development. Agricultural lands are valued not only for production, but as open space (Valley County 2018a).

#### Residential

The closest community to the Operations Area Boundary is the village of Yellow Pine, approximately 14 miles (northwest). Cascade, Donnelly, and Warm Lake are other communities within the analysis area. The existing transmission line passes through the Thunder Mountain Estates subdivision approximately 1 mile east of Cascade. Residential land use types include homesite land, recreation land, rural residential tracts, rural residential subdivisions, other rural land, urban residential lots, common areas, condominiums or townhouses, and various improvements to residential uses and lands (Valley County 2018a).

#### Fisheries

Activities pertaining to fisheries recovery are considered a major land use in and near the analysis area and are applicable to waterbodies. Recovery plans focus on actions that contribute to land use and land management actions including maintaining, protecting, and restoring tributary habitat; improving passage through barrier removal; reducing sediment delivery to streams by improving roads, riparian communities, and rehabilitating mine sites; restoring connectivity of populations; and conducting research.
and monitoring to implement and evaluate recovery activities (Forest Service 2022i). **Section 3.12** includes additional information regarding fisheries.

**Timber**

Timber harvest on NFS lands is guided by Forest Service regulations. On state and private lands, timber resources could be harvested in a manner that is compliant with IDL regulations. Timber resources in the SGP area are found on NFS, private, state, and BOR land (**Section 3.14**). **Section 3.14** includes additional information regarding timber resources.

**Tribal Uses**

Regional tribes exercise off-reservation rights for traditional land uses such as fishing, hunting, and gathering on NFS lands (Forest Service 2022q). **Section 3.24** includes additional information regarding tribal treaty rights, interests, and concerns.

**Recreation and Special Uses**

Public lands in the analysis area are widely used for recreation purposes. This includes NFS and state lands, which collectively make up about 80 percent of lands in the SGP area. Recreation use occurs during all seasons in the form of motorized recreation (e.g., all-terrain vehicles, snowmobiles), hunting and fishing, hiking, camping, canoeing/kayaking/rafting, biking, cross-country skiing, and snowshoeing. Nearby recreational facilities include trailheads, campgrounds, lookouts/cabins, picnic areas, and dispersed recreation areas (Forest Service 2022m). **Section 3.19** includes additional information on current recreation uses in the SGP area.

### 3.16 Access and Transportation

#### 3.16.1 Introduction

This section presents a brief description of local and regional transportation systems existing on land, air, and water in the analysis area, including roads, rail, port, and airstrips. The section focuses mainly on the local and regional road transportation system and provides a discussion of the road system development history, existing roads and areas of motorized access in the analysis area, vehicle accident data, and current (2015-2017 and 2019) traffic volumes.

#### 3.16.2 Access and Transportation Area of Analysis

The analysis area for access and transportation encompasses the overall road system (**Figure 3.16-1**). The analysis area is dominated by unpaved roads, one state highway, and county roads.
Figure 3.16-1
Access and Transportation
Area of Analysis
Stibnite Gold Project
Stibnite, ID
3.16.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to Access and Transportation. Additional descriptions of these regulations can be found in the SGP Access and Transportation Specialist Report (Forest Service 2022k).

Land and Resources Management Plan: National Forest Land and Resource Management Plans embody the provisions of the NFMA and guide natural resource management activities on NFS land. The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for access and transportation and include various objectives, guidelines, and standards for this purpose.

National Forest Management Act: The NFMA directs roads be designed to standards appropriate for intended uses and requires the revegetation of roads within 10 years of the termination of temporary and undeveloped roads created under contract, permit, or lease unless it is later determined that the road is needed for use as part of the National Transportation System (16 USC 1608 [b] and [c]).

Forest Roads and Trail Act Easements: Section 2 of the FRTA authorizes the road and trail systems for National Forests, the granting of easements across NFS lands, the construction of maximum economy roads, and the imposing of requirements on road users for maintaining and reconstructing roads (16 USC 532 et seq.). FSM 7703.3 states that, “Wherever possible, transfer jurisdiction over any NFS road and associated Forest transportation facilities (FSM 7705) to the appropriate public road authority when the road meets any of the following criteria: a) More than half the traffic on the road is not related to administration and use of NFS lands; b) The road is necessary for mail, school, or other essential local governmental purposes; c) The road serves yearlong residents within or adjacent to NFS lands” (Forest Service 2016d).

Travel Management Rule: Travel management planning is regulated by 36 CFR 212, 251, 261, and 295 – Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule. The final rule, effective in 2005, requires designation of roads, trails, and areas that are open to motor vehicle use by class of vehicle and applies to both summer and winter travel. The Travel Management Rule is divided into three subparts: A, B, and C (Forest Service 2019d).

Subpart A is the administration of the Forest Transportation System and includes the definitions for Part 212, which governs administration of the Forest Transportation System, designation of roads, trails, and areas for motor vehicle use (including OHVs). The PNF and BNF both completed a travel analysis process in September 2015 to inform future NEPA travel management decisions including identification of the minimum road system, identification of unneeded roads to be decommissioned or converted to other uses, and other changes to NFS roads, which include revisions to motor vehicle use designation (Forest Service 2019d, 2019e, 2019f).

Subpart B is the designation of roads, trails, and areas for motor vehicle use. The motor vehicle use map is developed under 36 CFR 212.51 (Forest Service 2019d). Subpart C designates and regulates use
specifically for OSVs. The Forest Service issued orders including maps showing the areas where OSV use is allowed, prohibited, or restricted.

State of Idaho Rules: The Idaho Surface Mining Act (Title 47, Chapter 15) requires the state to regulate mining activities, including but not limited to, mineral exploration, mine operations, reclamation of lands affected by exploration and mine operations. Implementing regulations under IDAPA 20.03.02 include provisions regarding the design, construction, maintenance, and reclamation of mining roads.

Valley County Master Transportation Plan: Valley County adopted its 2008 Master Transportation Plan to address the impacts of growth on the existing transportation system in the western portion of the county along SH 55 (Valley County 2008a). The Master Transportation Plan accounts for future growth and changes in land uses under Valley County’s jurisdiction. Valley County proposed recommendations for future improvements to the Valley County transportation network to support this anticipated growth.

Forest Service Manuals: FSM 2700 provides direction for special uses management on NFS lands. Chapter 2730 covers policies, authorities, and direction for granting rights-of-way for roads and trails across NFS lands and interests in lands. FSM 5400 covers landownership and Chapter 5460 provides direction concerning right-of-way acquisition. FSM 7700 provides direction for the planning, construction, reconstruction, operation, and maintenance of the Forest Transportation System.

3.16.4 Affected Environment

3.16.4.1 Existing Road Transportation Network

The Stibnite Mining District has been explored and mined since the early 1900s and included activities such as road construction and exploration. Many of the forest roads in the area were originally built to access mining claims or other remote sites and tend to be very steep, rocky, and winding (Forest Service 2019d).

The transportation network in the analysis area includes SH 55, Valley County roads, and NFS roads. Valley County maintains Warm Lake Road, Johnson Creek Road, and McCall-Stibnite Road on NFS lands through easements issued under the FRTA (Figure 3.16-1). For the purposes of this section, McCall-Stibnite Road is presented as three segments to provide a more location-specific discussion of existing conditions. These three segments include: Lick Creek Road (from SH 55 east to SFSR Road), East Fork Road (from SFSR Road east to the village of Yellow Pine), and Stibnite Road (from the village of Yellow Pine east to the Operations Area Boundary). There are approximately 130 miles of state roads, approximately 278 miles of Valley County roads, and approximately 1,557 miles of NFS roads in the analysis area.

Table 3.16-1 lists the existing primary roads in the analysis area by name, NFS road or CR number, a brief description of the route. The road width of SH 55 generally spans from 20 to 24 feet and the average posted speed limit is 55 miles per hour. Valley County road surface widths range from 14 to 26 feet and general speed limits range from 20 to 50 miles per hour (Valley County 2008b). NFS road surfaces in the SGP area range from 10 to 16 feet wide and most NFS roads do not have posted speed limits, but generally have a design speed limit of 5 to 15 miles per hour. Most roads in the PNF and BNF are single-lane, native surfaced roads with high rock fragment content from the rocky terrain and include pullouts.
for passing vehicles. General maintenance during snow-free months consists of grading and re-compacting the road surface, intermittent dust control, and periodic cleaning of drainage culverts and ditches.

The Forest Service Road Maintenance Levels (NFS MLs) are defined by the FSH 7709.59 – Road Systems Operations and Maintenance as the level of service provided by, and maintenance required for, a specific road which are consistent with road management objectives and maintenance criteria (Forest Service 2009c). Maintenance levels are summarized below:

- **Maintenance Level 5** – “Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities.” Some may have an aggregate surface and dust abatement may be used. They are usually an arterial or collector road. Typically, connect to state roads and CRs and include some developed recreation roads.

- **Maintenance Level 4** – “Assigned to roads that provide a moderate degree of user comfort and convenience at moderate traffic speeds. Most roads are double lane and have an aggregate surface.” However, some roads may be single lane. Some roads may be paved and/or dust abated. May connect to state and CRs and include some developed recreation roads.

- **Maintenance Level 3** – “Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.” Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. May include some dispersed recreation roads.

- **Maintenance Level 2** – “Assigned to roads open for use by high clearance vehicles. Warning signs and traffic control devises are not provided with the exception that some signing, such as W-18-1 ‘No Traffic Signs,’ may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Long haul may occur at this level.” These are local roads that connect to collectors and other local roads and may not be passable during periods of inclement weather.

- **Maintenance Level 1** – Assigned to intermittent service roads during the time they are closed to vehicular traffic, typically more than 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Roads receiving maintenance level 1 may be of any type, class, or construction standard, and may be managed at any other maintenance level while they are open for traffic. While being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

**Table 3.16-1 Existing Primary Roads in the Analysis Area**

<table>
<thead>
<tr>
<th>Name</th>
<th>FR/CR Number</th>
<th>Jurisdiction</th>
<th>Length</th>
<th>Access</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH 55</td>
<td>-</td>
<td>ITD</td>
<td>27.63 miles From Cascade north to McCall</td>
<td>Open year-round to highway legal vehicles</td>
<td>Asphalt road; Plowed in winter</td>
</tr>
<tr>
<td>Name</td>
<td>FR/CR Number</td>
<td>Jurisdiction</td>
<td>Length</td>
<td>Access</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------------------------------------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>CR 10-579</td>
<td>Valley County</td>
<td>34.32 miles From SH 55 east to just east of CR 10-413 at the start of the proposed Burntlog Route/Burnt Log Road</td>
<td>Open year-round to all vehicles</td>
<td>Asphalt road; Plowed to Warm Lake Parking Area; Groomed OSV from Warm Lake Parking Area to Landmark (8 miles)</td>
</tr>
<tr>
<td>Johnson Creek Road</td>
<td>CR 10-413</td>
<td>Valley County</td>
<td>25.10 miles From CR 10-579 north to the Stibnite Road portion of CR 50-412 at the village of Yellow Pine</td>
<td>Open year-round to all vehicles</td>
<td>Aggregate/native surfaced road; Groomed OSV from CR 10-579 north to Wapiti Meadow Ranch by Valley County; Plowed from Wapiti Meadow Ranch north to Yellow Pine by Valley County</td>
</tr>
<tr>
<td>Lick Creek Road</td>
<td>CR 50-412</td>
<td>Valley County</td>
<td>35.17 miles Portion of CR 50-412 from SH 55 east (in McCall) to FR 50674</td>
<td>Open year-round to all vehicles</td>
<td>Asphalt/aggregate/native surfaced road; Plowed for the paved portion and from Zena Creek Ranch to the end and ungroomed in between</td>
</tr>
<tr>
<td>East Fork Road</td>
<td>CR 50-412</td>
<td>Valley County</td>
<td>14.67 miles Portion of CR 50-412 from FR 50674 east to the village of Yellow Pine</td>
<td>Open year-round to all vehicles</td>
<td>Aggregate/native surfaced road; Plowed in winter by Valley County</td>
</tr>
<tr>
<td>Stibnite Road</td>
<td>CR 50-412</td>
<td>Valley County</td>
<td>14.71 miles Portion of CR 50-412 from the village of Yellow Pine east to FR 50375 (within the SGP) and continuing just south of the junction with FR 50375</td>
<td>Open year-round to all vehicles</td>
<td>Aggregate/native surfaced road; Plowed in winter by Perpetua through agreement with Valley County</td>
</tr>
<tr>
<td>Warren-Profile Gap Road*</td>
<td>CR 50-340</td>
<td>Valley County</td>
<td>27 miles From CR 50-412 north to Edwardsburg- Big Creek</td>
<td>Open year-round to all vehicles</td>
<td>Aggregate/native surfaced road</td>
</tr>
<tr>
<td>SFSR Road</td>
<td>FR 50674</td>
<td>PNF</td>
<td>23.65 miles From FR 474 north to East Fork Road CR 50-412</td>
<td>Open year-round to highway legal vehicles (a 2-mile stretch between Buckhorn Creek Trailhead and Jackie Creek/Phoebe Creek Trailhead is open to all vehicles.)</td>
<td>Also locally known as South Fork Road; Asphalt road; Plowed in winter by Valley County (under Schedule A agreement) NFS ML: 4</td>
</tr>
<tr>
<td>SFSR Road</td>
<td>FR 474</td>
<td>BNF</td>
<td>7.19 miles From CR 10-579 north to FR 50674</td>
<td>Open year-round to highway legal vehicles</td>
<td>Also locally known as South Fork Road; Asphalt road; Plowed in winter by Valley County (under Schedule A agreement). NFS ML: 4</td>
</tr>
<tr>
<td>Name</td>
<td>FR/CN Number</td>
<td>Jurisdiction</td>
<td>Length</td>
<td>Access(^1,2,3)</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-----------------------------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Burnt Log Road</td>
<td>FR 447</td>
<td>BNF</td>
<td>21.73 miles</td>
<td>Open year-round to all vehicles</td>
<td>Native surfaced road; Last 0.25 to 0.5 mile of road is closed, and motorized traffic is prohibited; Groomed OSV route from Landmark by Valley County (approximately 9.8 miles total: 6 miles groomed and 3.8 miles of infrequently groomed). NFS ML: 3 (4 miles) and 2 (17 miles)</td>
</tr>
<tr>
<td>Thunder Mountain Road</td>
<td>FR 50375</td>
<td>PNF</td>
<td>5.14 miles</td>
<td>Open year-round to all vehicles</td>
<td>Native surfaced road. NFS ML: 2</td>
</tr>
<tr>
<td>Thunder Mountain Road</td>
<td>FR 440</td>
<td>BNF</td>
<td>8.54 miles</td>
<td>Open year-round to all vehicles</td>
<td>Also locally known as Old Thunder Mountain Road; Native surfaced road. NFS ML: 2</td>
</tr>
<tr>
<td>Meadow Creek Lookout Road</td>
<td>FR 51290</td>
<td>PNF</td>
<td>11.46 miles</td>
<td>Open year-round to all vehicles</td>
<td>Native surfaced road. NFS ML: 2</td>
</tr>
<tr>
<td>Horse Heaven Road</td>
<td>FR 416W</td>
<td>BNF</td>
<td>2.19 miles</td>
<td>Open year-round to all vehicles</td>
<td>Also locally known as Riordan or Powerline Road; Native surfaced road. NFS ML: 2</td>
</tr>
<tr>
<td>Cabin Creek Road</td>
<td>FR 467</td>
<td>BNF</td>
<td>10.58 miles</td>
<td>Open to all vehicles from June 1 to September 15</td>
<td>Native surfaced road. NFS ML: 2</td>
</tr>
<tr>
<td>Paradise Valley Road</td>
<td>FR 488</td>
<td>BNF</td>
<td>1.74 mile</td>
<td>Open year-round to all vehicles</td>
<td>Native surfaced road. NFS ML: 2</td>
</tr>
</tbody>
</table>

Source: Forest Service 2005b, 2018c, 2019d, 2019e, 2019f, -2019g; Valley County 2014, 2019c
*Warren-Profile Gap Road is outside of the analysis area but could be used to access the SGP when connecting from the north to Stibnite Road.

\(^1\)Roads Open to Highway Legal Vehicles = These roads are open only to motor vehicles licensed under state law for general operation on all public roads within the state.

\(^2\)Roads Open to All Vehicles = These roads are open to all motor vehicles, including smaller OHVs that may not be licensed for highway use (but not to oversize or overweight vehicles under state traffic law).

\(^3\)Unless otherwise noted, FR roads are closed by snow in the winter and re-open once snow melts in the spring.
The maintenance of certain NFS roads is coordinated between the Forest Service and Valley County through Schedule A agreements. Typically, NFS road maintenance activities (including dust control, removal of debris from roadway and rights-of-way, road repair, and snow removal) are coordinated with the Valley County Roads and Bridge Department. Most Valley County backcountry roads are closed through the winter and melt off in the spring (Valley County 2017). Similarly, NFS roads are closed by snow in the winter and re-open once the snow melts off in the spring. Therefore, roads do not open for through-traffic until at least mid-June and often close to public use as early as October 15.

### 3.16.4.2 Primary Routes

There are three existing primary routes within the analysis area to access the Operations Area Boundary from Cascade or McCall: Johnson Creek, Lick Creek, and SFSR routes as shown on Figure 3.16-1. All of the routes require the use of Idaho SH 55.

#### Johnson Creek Route

During non-winter conditions (roads clear of snow), the Operations Area Boundary can be accessed from the City of Cascade by traveling northeast on Warm Lake Road for about 34 miles to Landmark, then north on Johnson Creek Road for approximately 25 miles to the village of Yellow Pine, and approximately 14 miles east on the Stibnite Road portion of McCall-Stibnite Road (Stibnite Road). The Johnson Creek Route, which only includes Johnson Creek Road and the Stibnite Road portion of McCall-Stibnite Road, is currently used to access the Operations Area Boundary during the summer.

The Johnson Creek Road is a county maintained, native surface road that is open to vehicles with seasonal restrictions due to snow. During the winter, Valley County plows approximately 10 miles of Johnson Creek Road from Yellow Pine to Wapiti Meadow Ranch and Perpetua (under agreement with Valley County) plows along Stibnite Road. Valley County grooms the remaining 17 miles of Johnson Creek Road from Wapiti Meadow Ranch to Warm Lake Road at Landmark for OSV use. Valley County does not plow Warm Lake Road from Warm Lake to Landmark. This section is a designated groomed OSV route.

The Stibnite Road portion of the route is also a county-maintained native surface road, open to all vehicles with seasonal restrictions due to snow. This road is plowed in the winter by Perpetua through an agreement with Valley County. Stibnite Road connects to Thunder Mountain Road on the southeastern portion of the Stibnite site and currently provides public access through the site.

#### Lick Creek Route

The SGP also can be accessed from McCall during non-winter conditions by traveling east on the Lick Creek portion of McCall-Stibnite Road (Lick Creek Road) for approximately 37 miles to the East Fork South Fork portion of McCall-Stibnite Road (East Fork Road), then approximately 16 miles to the village of Yellow Pine, and approximately 14 miles east on Stibnite Road. Lick Creek Road is not maintained during the winter; however, East Fork Road and Stibnite Road are plowed from SFSR Road to Yellow Pine by Valley County and from Yellow Pine to the Operations Area Boundary by Perpetua to access their private land inholdings in the area.
**South Fork Salmon River Route**

Additionally, the Operations Area Boundary can be accessed year-round from Cascade by traveling approximately 24 miles northeast on Warm Lake Road to the intersection with SFSR Road, then north on SFSR Road for approximately 30 miles to McCall-Stibnite Road, and approximately 30 miles east on McCall-Stibnite Road (i.e., East Fork Road and Stibnite Road). Some segments along SFSR Road have sharp curves which can be challenging for heavy vehicle travel. However, this route currently provides the only access to the Operations Area Boundary during winter months.

**Warm Lake Road**

Warm Lake Road (CR 10-579) is a two-lane (one lane each direction), asphalt-paved roadway with lane markings open year-round to all vehicles from SH 55 to Warm Lake. The road starts in Cascade at an intersection with SH 55, which is a major north-south transportation corridor. This intersection would be used by all mine-related traffic through all phases of the SGP. The Warm Lake Road continues eastward for approximately 35 miles, ending at Johnson Creek Road (CR 10-413) at Landmark. Warm Lake Road is under the jurisdiction of Valley County. Currently, Valley County does not maintain Warm Lake Road in winter beyond Warm Lake Lodge. With adequate snowpack, an 8-mile segment of the Warm Lake Road route east of Warm Lake Lodge is used as an OSV route, allowing access into Landmark and points beyond.

### 3.16.4.3 Existing Stream Crossings

Existing stream crossings along the existing Johnson Creek, Stibnite, and Burnt Log roads are shown on Figure 3.16-1. There are 213 existing stream crossings along existing main access roads in the analysis area. These crossings include intermittent and perennial streams and irrigation canals and ditches (USGS 2021a). Additional details on existing stream crossings are found in the SGP Access and Transportation Specialist Report (Forest Service 2022k).

### 3.16.4.4 Existing Seasonal Access for OHVs and OSVs

OHVs can access the roads and trails throughout the analysis area during both summer and winter seasons. Currently, OHVs can access the Operations Area Boundary primarily from Stibnite Road to Thunder Mountain Road in order to reach Monumental Summit and the Lookout Mountain Trailhead in the summer. More detailed discussion on existing recreational access within the recreation analysis area is provided in Section 3.19.

During the winter, numerous roads in the analysis area are plowed for vehicle use or groomed for OSV use (Valley County 2019c). Specifically, Valley County plows the following roads/road sections for highway legal vehicle use during the winter: East Fork Road from SFSR Road to Yellow Pine; Johnson Creek Road from Yellow Pine to Wapiti Meadow Ranch, the beginning and end portions of Lick Creek Road, and Warm Lake Road from SH 55 to Warm Lake under existing FRTA easements. Valley County also plows SFSR Road for use during the winter under a Schedule A cooperative maintenance agreement. Perpetua plows Stibnite Road from Yellow Pine to the SGP under an annual road maintenance agreement with Valley County to maintain access to their private land inholdings in the area.
Valley County currently grooms for OSV use the portion of Johnson Creek Road from Wapiti Meadow Ranch to Warm Lake Road (approximately 17 miles) and the length of Warm Lake Road from Warm Lake to Landmark (approximately 11 miles). Valley County also grooms Burnt Log Road for OSV use (approximately 9.8 miles total: 6 miles groomed and 3.8 miles of infrequently groomed). Cabin Creek Road is currently used during the summer and is not a groomed OSV route.

### 3.16.4.5 Existing Traffic Conditions

Existing vehicle traffic was determined by traffic count data collected on local roadways and at SH 55 intersections in the analysis area (HDR 2017l, 2017m; ITD 2017). Traffic count data was collected to record two-way road usage at nine sites from July through October from 2015 through 2016.

**Table 3.16-2** summarizes the baseline traffic volumes (i.e., AADT) for key roadway segments in the analysis area.

<table>
<thead>
<tr>
<th>Name</th>
<th>FR/CR Name</th>
<th>AADT[^1,^2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH 55</td>
<td>-</td>
<td>4,900</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>CR 10-579</td>
<td>1,670</td>
</tr>
<tr>
<td>Johnson Creek Road</td>
<td>CR 10-413</td>
<td>70</td>
</tr>
<tr>
<td>Stibnite Road[^3] (Yellow Pine to Stibnite)</td>
<td>CR 50-412</td>
<td>30</td>
</tr>
<tr>
<td>Burnt Log Road</td>
<td>FR 447</td>
<td>70</td>
</tr>
<tr>
<td>East Fork Road[^4] (SFSR Road to Yellow Pine)</td>
<td>CR 50-412</td>
<td>84</td>
</tr>
<tr>
<td>Thunder Mountain Road[^5]</td>
<td>FR 440</td>
<td>11</td>
</tr>
<tr>
<td>Horse Heaven Road[^5]</td>
<td>FR 416W</td>
<td>6</td>
</tr>
</tbody>
</table>

[^1]: Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

[^2]: Average daily traffic count data provided by Forest Service for calendar year 2014 at Lick Creek Summit (35 AADT), East Fork (Eiguren Ranch) (37.8 AADT), South Fork (confluence) (34.7 AADT), Profile Summit (14.1 AADT), and Stibnite (18.1 AADT) support the data provided in Table 3.16-2. However, for consistency purposes, the 2015, 2016, and 2019 data collected would be used to account for traffic counts along the segments.

[^3]: A portion of the traffic turns off onto Warren-Profile Gap Road towards Big Creek/Edwardsburg (approximately 5 to 18 vehicles between 2014 through 2016). However, for purposes of this analysis, all traffic on Stibnite Road between Yellow Pine and the SGP is considered.

[^4]: This road considers traffic counts available from 2015-2017 data as more recent traffic counts for the specific road segments from SFSR Road to Yellow Pine were not available from the ITD.

[^5]: The traffic counts are assumed to include OHVs only. These roads include 2015-2017 traffic counts as more recent data was not available from the ITD.

The traffic volumes along the key roadway segments decrease with distance from SH 55. SH 55 is a public highway classified by Valley County as a principal arterial per the ITD functional classification that provides for relatively high travel speeds and minimum interference to through movement (American Association of State Highway and Transportation Officials [AASHTO] 2018; Valley County 2008a). Warm Lake Road has the most daily traffic of the county and NFS roads in the analysis area. Many recreational facilities are located off this road including numerous facilities near Warm Lake. Residences
are spread out along Warm Lake Road within 4 miles of SH 55 and along McCall-Stibnite Road in Yellow Pine and north to Big Creek using Warren-Profile Gap Road. Warm Lake Road, Johnson Creek Road, and McCall-Stibnite Road are considered county collector roads per ITD functional classification (Valley County 2008a).

Traffic volume in the analysis area is mainly attributed to recreational activities and residential traffic. Other activities could include fuels management, road and utility maintenance activities, and timber harvest. In addition, current traffic levels in the analysis area also can be attributed to the activities that have been ongoing since 2009 for exploration purposes, monitoring, background studies, and private property infrastructure maintenance. Traffic volume and traffic behavior vary depending on the day of the week and the season. Valley County has many summer recreational areas that attract visitors from May through October with peak levels in June, July, and August. Although the AADT is less during the winter months, winter driving conditions influence the amount of traffic (Valley County 2008a).

3.16.4.6 Vehicle Accidents

Vehicle accident data for full-size vehicles, motorcycles, and OHVs from 2000 through 2021 was obtained from Valley County Sheriff’s Department records for the six roads associated with the three existing primary access routes to the Operations Area Boundary. Warm Lake Road experienced an average of seven accidents per year from 2000 through 2021, followed by SFSR Road with an average of two accidents per year, Lick Creek Road with two accidents per year, Johnson Creek Road with one accident per year, and Stibnite Road and East Fork Road with no accidents on average per year (Ulberg 2017, VCSD 2022).

According to the Valley County Sheriff’s traffic incident records from 2000 through 2021, the causes of most accidents on the existing roadways fall under the general categories of driver error, vehicle mechanical issues, and environmental factors (Ulberg 2017, VCSD 2022).

3.16.4.7 Golden Meadows Exploration

The previously authorized Golden Meadows mineral exploration activities began in 2009 and currently use the existing road transportation network. The exploration area is accessed via the Johnson Creek Route during the summer and the SFSR Route during the winter. Activities include the construction of short temporary trails, reopening of former roads, and use of existing non-system roads to access adjacent areas of private inholdings or drill sites. These temporary roads would be reclaimed once access to adjacent areas of private inholdings is no longer required or when drilling is completed, and drill sites reclaimed.

3.17 Heritage Resources

3.17.1 Introduction

This section describes the existing (baseline) conditions relevant to Heritage Resources that have the potential to be affected by the SGP.
3.17.1.1 Definitions

For purposes of this report, the term heritage resource will be utilized in place of cultural resource to describe archaeological sites, historic buildings and structures, trails, roads, infrastructure, and other places of traditional, cultural, or religious importance that represent the physical aspects of the activities of past or present cultures. Heritage resources can be human-made or natural features and are, for the most part, unique, finite, and nonrenewable.

Although the terminology has been amended for purposes of this report, the definition of heritage resource is that of a cultural resource which is defined in the FSM 2300 under Section 2360.5, and as follows:

*an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources include prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (Forest Service 2008a).*

Categories of heritage resources described in this report are synonymous with those resources identified in the above-detailed definition. However, the analysis of potential impacts to heritage resources as detailed in Section 4.17 is limited to historic properties, as defined by Section 106 of the NHPA and its implementing regulations at 36 CFR 800. Historic properties are defined as:

*...any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria (36 CFR 800.16).*

Historic properties include not only archaeological and historic architectural resources, but also CLs, and TCPs. As defined by the NPS, TCPs are a distinct category of historic property eligible for listing in the NRHP due to their association with cultural practices or beliefs rooted in a living community’s history and importance in maintaining the cultural identity of that community (Parker and King 1998). A TCP must be a tangible property, that is, a district, site, building, structure, or object as defined in 36 CFR 64.4 (FSM 2360.5). Its significance must be documented and evaluated in accordance with the four NRHP criteria (Parker and King 1998).

A TCP may be a building, site, district, object, or landscape. The significance must go beyond the past 50 years yet retain ongoing significance. Although the same seven aspects of integrity are relevant, National Register Bulletin 38 (Parker and King 1998) notes that the concept of integrity is applied somewhat differently for TCPs than it is for archaeological sites:

*In the case of a traditional cultural property, there are two fundamental questions to ask about integrity: 1) does the property have an integral relationship to traditional cultural practices or beliefs; and 2) is the condition of the property such that the relevant relationships survive (Parker and King 1998).*
CLs are defined by the NPS as:

A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes (NPS 2020).

Regulations under the NHPA and NEPA provide that impacts to TCPs and CLs, if applicable, be considered in the agency’s Section 106 consultation for any proposed federal agency action. Because Native American tribes can be affected by the policies and actions of the Forest Service in managing the lands and resources under its jurisdiction, the Forest Service has a duty to consult with them on matters affecting their interests. Because of this government-to-government relationship, efforts were and continue to be made to involve local tribal governments and to solicit their input regarding potential effects to heritage resources. The structure of formal government-to-government consultation is between tribal governing bodies (Executive Committee, Tribal Councils, Tribal Chairperson, traditional Chiefs, or those identified formally by a tribe’s governing body as ‘representative’ of that tribe’s interests) and Forest Service Line Officers. Staff-to-staff meetings usually include Forest Service technical specialists and tribal liaison and technical specialists. Tribal consultation for the SGP was initiated with each tribe in the spring of 2017 and is ongoing.

3.17.1.2 NRHP Criteria and Integrity

The criteria for determining whether cultural resources are eligible for listing in the NRHP and therefore considered historic properties are provided in 36 CFR 60.4. The NRHP criteria are as follows:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and

a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

b) That are associated with the lives of persons significant in our past; or

c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) That have yielded, or are likely to yield, information important in prehistory or history.

While nearly all sites have the potential to yield information useful in addressing a limited number of research questions, this limited potential alone is not considered enough to qualify a site for inclusion in the NRHP under Criterion D. Federal guidelines encourage the use of a set of research questions that are generally recognized as important research goals as a means of evaluating significance. If a site contains information that is demonstrably useful in answering or refuting such questions, it can be considered a significant site under Criterion D.
In order to be a historic property, resources must meet one or more of the NRHP criteria and must retain the aspects of integrity of location, design, setting, materials, workmanship, feeling, and association. The NPS NRHP guidance defines integrity as:

...the ability of a property to convey its significance. To be listed on the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it must also have integrity. The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property’s physical features and how they relate to its significance.

Historic properties either retain integrity (that is, convey its significance) or they do not. Within the concept of integrity, the NRHP criteria recognize seven aspects or qualities that, in various combinations, define integrity. To retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. The seven aspects are: location, design, setting, materials, workmanship, feeling, and association (NPS 1995).

A property does not have to exhibit all seven aspects of integrity but must retain those aspects that are essential for conveying its significance. For example, integrity of association with an event or person is critical for sites that are significant under Criteria A or B, and integrity of design, material, and workmanship would be important to a building significant under Criterion C. Integrity of location, materials, and workmanship would be important for a precontact artifact scatter significant under Criterion D for its research value in understanding precontact technology and site function.

3.17.2 Heritage Resources Area of Analysis

The analysis area for heritage resources includes the area where effects may be caused by the proposed activities (FSH.1909.15.10, 15.2a). The analysis area is coterminous with the Section 106-defined APE as detailed below.

Per 36 CFR 800.16(d), an APE is defined as...the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking…” The APE defines that area within which the identification of historic properties will occur.

The APE encompasses the geographic area within which the SGP may cause alterations in the character or use of historic properties, if any such properties exist. Two APEs were identified for the SGP (Figure 3.17-1; Table 3.17-1). The physical APE encompasses the area where physical disturbance may occur. It includes the mine site, access roads, utilities, and offsite facilities along with a 100-meter (m) (330 foot) buffer zones around most of these areas to account for variations in alignments, access, and other incidental ground disturbance. The VAV APE is generally defined as the same as the physical impacts APE surrounding the mine site but extending out to the next higher ridgeline in some areas, a 0.8-km (0.5 mile) buffer on either side of the existing access roads and existing transmission line, a 1.6-km (1 mile) buffer on either side of the Burntlog Route and segment of new transmission line, and a 0.8-km (0.5 mile) buffer surrounding off-site facilities; these areas encompass the extent of potential SGP-related visual, auditory, and vibratory impacts to historic properties. Noise and vibration attenuate as a function of
**LEGEND**

- Physical Effects APE
- Visual/Auditory/Vibratory APE

**Project Components**

- SGP Features
- Burntlog Centerline
- Johnson Creek Centerline

**Utilities**

- Powerline

**Other Features**

- U.S. Forest Service
- Wilderness
- County
- City/Town
- Highway
- Road
- Stream/River
- Lake/Reservoir

**Surface Management Agency**

- Bureau of Land Management
- Bureau of Reclamation
- Private
- State
- State Fish and Game
- State Parks and Recreation
- U.S. Forest Service

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**Figure 3.17-1**

Heritage Resources
Areas of Potential Effects
Stibnite Gold Project
Stibnite, ID

Base Layer: ESRI World Shaded Relief Service
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

* Project Components are associated with all Action Alternatives
** Burntlog Maintenance Facility only pertains to 2021 MMP
*** Landmark Maintenance Facility only pertains to Johnson Creek Alternative.
distance from the source, ground absorption, atmospheric conditions, and the presence of physical barriers. Visual impacts from visible physical features on the landscape also decrease with distance. Given the location of the SGP in a mountainous area, natural topography would conceal the mine and associated facilities from certain lines of sight.

Table 3.17-1 Summary of the APEs

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Extent of Physical APE</th>
<th>Extent of Visual, Auditory, Vibratory APE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
<td>Generally coincides with the extent of the Operations Boundary but extends to the east to encompass the Thunder Mountain Road Corridor and areas where physical effects may reasonably occur.</td>
<td>Generally coterminous the Physical Effects APE on the west and south sides of the Operations Boundary. Extensions to account for potential effects that could be reasonably anticipated are bound by the first ridge above the mine footprint, generally following the highest elevation contour of approximately 7,500 feet.</td>
</tr>
<tr>
<td>Access Roads to the Mine Site</td>
<td>100-m (330 foot) buffer on each side of the center line</td>
<td>0.8-km (0.5 mile) buffer on each side of the center line</td>
</tr>
<tr>
<td>Burntlog Route</td>
<td>100-m (330 foot) buffer on each side of the center line</td>
<td>1.6-km (1.0 mile) buffer on each side of the center line</td>
</tr>
<tr>
<td>Transmission Line</td>
<td>100-m (330 foot) buffer on each side of the center line</td>
<td>0.8-km (0.5 mile) buffer on each side of the center line</td>
</tr>
<tr>
<td>Offsite Facilities</td>
<td>100-m (330 foot) buffer on above-ground facilities including maintenance facilities, telecommunications towers, logistics facility</td>
<td>0.8-km (0.5 mile) buffer on each side of the center line</td>
</tr>
</tbody>
</table>

3.17.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternatives. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to heritage resources. Additional descriptions of these regulations can be found in the SGP Heritage Resources Specialist Report (Forest Service 2022l).

National Forest Land and Resource Management Plans: Heritage resources are managed consistently with established and approved Forest Service Heritage Program Plans; FSM 2300, Chapter 2360; and FSH guidance (FSH 2309.12).

Implementation of Heritage Program planning is completed to identify priority heritage assets, recommend allocation of heritage resources to management categories that reflect their primary value (i.e., cultural/traditional, scientific, interpretive, or continued use), develop historic preservation management plans, and guide implementation of compliance, protection, and stewardship activities.

The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) regulate heritage resources to achieve the desired outcomes and conditions for the Heritage Program.
In addition to specific standards and guidelines, the Payette Forest Plan and Boise Forest Plan describe the desired conditions for Heritage Program resources in the following way:

*People visiting the National Forest should be able to explore, enjoy, and learn about cultural heritage. As visitors travel through landscapes and experience diverse environments and cultures, they make a personal connection with the land and the people and have an opportunity to reflect on the relevance of the past and the land to their daily lives. Sites determined to be significant, under the NHPA, are inventoried, protected, and if warranted, nominated to the NRHP (Forest Service 2003a, 2010a).*

**Antiquities Act of 1906:** The Antiquities Act of 1906 protects all historic and prehistoric sites on federal lands and prohibits excavation or destruction of such antiquities unless a permit (Antiquities Permit) is obtained from the Secretary of the department that has jurisdiction over those lands. In addition, it authorizes the President to declare areas of public lands as National Monuments and to reserve or accept private lands for that purpose. (54 U.S.C. §§320301-320303).

**National Historic Preservation Act:** The NHPA of 1966, as amended through December 16, 2016 (Public Law [P.L.] 89-665, as amended by P.L. 96-515; 54 USC 300101 *et seq.*) is the principal federal law protecting historic properties.

Section 106 of the NHPA (54 USC 306108) directs all federal agencies to consider the effect of their undertakings (i.e., actions, financial support, and authorizations) on any historic properties. The Advisory Council on Historic Preservation (ACHP) regulations at 36 CFR 800 implement Section 106. Procedures are outlined for identifying resources; evaluating their significance; assessing effects; implementing measures to mitigate adverse effects; and consulting with the ACHP, State Historic Preservation Offices (SHPOs), Tribal Historic Preservation Offices, and other interested parties. The NRHP is used as a planning tool under these regulations to help federal agencies evaluate the significance of cultural resources. Additionally, the NHPA requires federal agencies to consult with Native American tribes to determine whether there are properties of traditional religious and cultural importance to Indian tribes that may be eligible to the NRHP (54 USC 302706).

**National Environmental Policy Act:** NEPA, as amended (P.L. 91-190, January 1, 1970, as amended by P.L. 94-52, P.L. 94-83, and P.L. 97-258; 42 USC 4321-4347) implemented by Council on Environmental Quality regulations at 40 CFR 1500-1508 requires agencies to consider the effects of proposed actions before making decisions that affect historic properties and the human environment. Under the NEPA, agencies must consider potential “cultural” effects as well as effects on historic properties (40 CFR 1508.8).

For the SGP, the Forest Service has determined that a Programmatic Agreement (PA) is required to ensure compliance with 36 CFR 800. A PA addresses historic properties that may be affected by a project to minimize or resolve any potential adverse effects. A PA outlines measures for compliance with Section 106 of the NHPA, including but not limited to, protocols for the identification and evaluation of historic properties, permitting requirements, treatment of historic properties, monitoring requirements, inadvertent discovery protocols, curation, and treatment of human remains. The PA would identify known adverse effects to historic properties and provide a discussion of proposed mitigation measures that would be implemented. A PA is a legal document with signatories and concurring parties. Agency signatories,
invited signatories, and concurring or consulting parties would include the Forest Service, the USACE, the Idaho SHPO, the ACHP, IPCo, Native American tribes, as well as Perpetua. The PA would be in place prior to completion of the ROD.

Archaeological Resource Protection Act (ARPA) of 1979: The purpose of ARPA, is to secure the protection of archaeological resources and sites which are on public lands and tribal reservation lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources. The law applies to any agency that receives information that a direct or federally assisted activity could cause irreparable harm to prehistoric, historic, or archaeological data and provides criminal penalties for prohibited activities (16 U.S.C. § 470aa).

Native American Graves Protection and Repatriation Act (NAGPRA): The NAGPRA became law in 1990; the regulations implementing the statute were completed and went into effect in January 1996. This law formally affirms the rights of Native American tribes, Native Alaskan entities, and Native Hawaiian organizations to custody of Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony with which they have a relationship of cultural affiliation. NAGPRA gives even stronger custody rights to lineal descendants when such a close relationship can be documented. In addition, the law and regulations describe procedures designed to ensure that all Americans can derive educational, historical, and scientific value from the remains and objects covered by the statute through public interpretation, documentation, and study (25 U.S.C. § 3001 et seq.).

Executive Order 11593 – Protection and Enhancement of the Cultural Environment: This EO (EO), signed in 1971, furthers the NEPA of 1969, the NHPA of 1966, and the Antiquities Act of 1906 by requiring federal agencies to administer cultural properties under their control and direct their policies so that federally owned sites, structures, and objects of historical, architectural, or archeological significance are preserved, restored, and maintained. To achieve this goal, federal agencies must review properties under their jurisdiction and nominate properties that qualify for listing on the NRHP. If any Federal action planned will substantially alter or demolish a property listed on the NRHP, federal agencies must make detailed records of the property and deposit those records in the Library of Congress for future use. Federal agencies must annually prepare and submit to the Secretary of the Interior and the ACHP procedures to provide for the maintenance, preservation, and restoration of federally owned sites. The EO also enumerates responsibilities of the Secretary of the Interior regarding such properties.

State and Local Policy: The Idaho State Historic Preservation Plan, Preserving the Past, Enriching the Future, Idaho State Historic Preservation Plan, 2016-2022, (ISHPO 2016) discusses trends affecting Idaho’s cultural resources, presents preservation goals and objectives, and introduces broadly drawn categories for historic contexts as a framework for further development of this tool. The plan seeks to establish priorities and goals for historic preservation in Idaho and serve to unite a variety of historic preservation groups and professionals in implementing the plan’s goals through an established framework.

The following state laws, as summarized in the Idaho State Historic Preservation Plan, apply to heritage resources:
• **Idaho Code 18-7027**: Prohibits the disturbance of prehistoric human burials, or the possession of human remains or artifacts removed from a burial, unless the excavation is conducted by a qualified archaeologist with the prior approval of the State Historical Society and the appropriate Indian tribe.

• **Idaho Code 27-501**: Assigns responsibilities to the agency for consultation, determination of appropriate actions, and providing for re-interment of human remains that have been disturbed.

• **Idaho Code 33-39**: Provides for the creation of an Idaho Archaeological Survey and designates the State Archaeologist as director.

• **Idaho Code 67-41**: States that the agency [Idaho State Historical Society] shall: Identify, preserve, and protect sites, monuments, and points of interest in Idaho of historic merit. (67-4114); Protect archaeological and vertebrate paleontological sites and resources on public land. (67-4119); Govern the agency and administer the powers and duties required to preserve and protect any historical record of the history and culture of Idaho” (67-4123). Senate Bill 1011 (2009), passed by the Senate and House and signed into law by the governor April 14, 2009, defines “historical record” as “any record, artifact, object, historical or archaeological site or structure, document, evidence or public or private writing pursuant to the provisions of title 9, Idaho Code, relevant to the history of the state of Idaho.”; Encourage and promote interest in the history of Idaho. (67-4126 [2]); Collect, preserve, and exhibit artifacts and information illustrative of Idaho history, culture and society. (67-4126 [3]); and Identify historic, architectural, archaeological, and cultural sites, buildings, or districts, and to coordinate activities of local historic preservation commissions. (67-4126 [14]).

• **Idaho Code 67-46**: Gives authority to the agency to carry out the preservation and protection of the state’s historic, archaeological, architectural, and cultural heritage resources. This section of code also authorizes municipalities to create historic preservation commissions, establish design review for historic districts, and carry out other historic preservation efforts at the local level.

• **Idaho Code 67-65**: The Idaho Local Planning Act of 1975 requires a local governments’ comprehensive plan must include a component for “Special Areas or Sites.” There must be an analysis of areas, sites, or structures of historical, archaeological, or architectural significance within the jurisdiction of the governing board.

### 3.17.4 Affected Environment

The heritage resources analysis area is in the upper East Fork SFSR drainage, approximately 3 miles west of the FCRNRW and approximately 10 air miles southeast of the village of Yellow Pine. The heritage resources analysis area comprises a heavily vegetated landscape marked by major river canyons and tributaries. The mine site is situated in the Salmon River Mountains, a high-relief mountainous physiographic province in central Idaho, and rests at an elevation of approximately 6,500 feet, with nearby mountains rising to elevations of approximately 7,800 to 8,900 feet amsl (Mitchell 2000). Major waterways include the East Fork SFSR, Meadow Creek, and Sugar Creek, and their numerous tributaries (Mitchell 2000). Vegetation in the heritage resources analysis area varies from riparian marsh wetland areas to spruce-fir forests.

Portions of the heritage resources analysis area have historically been heavily mined and modern mining disturbance occurs to the present day. The analysis area has been subject to extensive mining-related
activities over the past century including underground and open pit mining, heap leaching, ore processing, smelting, tailings disposal, development rock disposal, construction of town and camp sites, haul roads, powerlines, landfills, waterway diversions, hydro-power dam development (and failure), etc. These past mining activities have resulted in impacts to the natural environment including deforestation and accelerated erosion; increased sedimentation; elevated metals loading in surface and ground waters; diversion and degradation of natural waterways, including the East Fork SFSR; blockages to anadromous fish passage; impaired water quality; and compromised fish habitat, waterways, and wetlands. Additionally, extensive forest fires have compounded the human-created impacts and have increased soil erosion and impacted water quality. Other impact agents include but are not limited to previous road construction, and recreation related impacts such as dispersed camping, and non-motorized and motorized trail development.

3.17.4.1 Cultural Context

Cultural context refers to the past human groups that have used the analysis area for various purposes throughout the precontact period and the contact or historic period. In addition, the cultural context provides some information concerning indigenous communities’ continued connections and practices in the analysis area along with the mining activities that have occurred at Stibnite during the modern era. More recent use of the analysis area has been related to mining (beginning in the mid-1800s), recreational activities, and traditional tribal hunting, fishing, and plant gathering among other practices. A historic context of the Stibnite area was prepared for the SGP (Midas Gold 2016a). Additionally, the Nez Perce Tribe, the Shoshone-Paiute Tribes, and the Shoshone-Bannock Tribes have prepared ethnographies of the analysis area (Battaglia 2018; Walker 2019; Lahren 2020). General archaeological themes in the analysis area and vicinity include pre-contact archaeology, ranching, settlement, Forest Service history, traditional practices, and mining. Detailed contextual information is presented in the Heritage Resources Specialist Report (Forest Service 2022l) and detailed ethnographic information is also included in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q).

Pre-contact Period

Native Americans were present in central Idaho as early as 15,000 years before the present (B.P.) (Gannon 2019). Paleoindian tools have been recovered from archaeological sites in Valley County, including a Clovis projectile point, or spearhead, in Yellow Pine during excavations for a church in 1985. Artifacts also have been found along Johnson Creek and the Middle and South Forks of the Salmon River (Woods 2002). Eligible archaeological historic properties have been recorded along the area’s river corridors and in high elevations. More recent evidence of Archaic occupation in the analysis area is seen in precontact site 10VY1488, recorded in 2016. The site contains stone tool chipping debris and projectile point types that date to the Archaic period or from around 4,000 B.P. (Lahren and Pollock 2016).

Since the early systematic archaeological research work in Idaho of Swanson (Swanson 1972) and Butler in the 1960s and early 1970s (Butler 1978, 1986), a variety of precontact chronologies for Idaho have been developed by Pavesic (1978), Franzen (1981), Reed et al. (1986), Holmer (1986, 1994), Plew (2008), Meatte (1990), Lohse (1993), Roll and Hackenberger (1998), Yohe and Woods (2002), and Simms (2008). These researchers (among others) studied settlement, subsistence, technology, and cultural interaction of indigenous groups in the analysis area. These overviews provide understanding of the
different degrees of cultural continuity and variability presented in the archaeological record. Plew (2008) developed a chronology that combines some of these sequences.

**Paleoindian Tradition (15,000-9,000 B.P.).** The Paleoindian Tradition centers on the hunting of big-game animals that became extinct during the terminal phase of the Late Pleistocene or in the early Holocene. Paleoindian people were extensively mobile and engaged in a food economy driven by the availability of big game that ranged widely across the landscape (Simms 2008). It is assumed their diet also included small game and plants (Lohse 1993). Generally, archaeological evidence for the Paleoindian Tradition in upland areas of central Idaho are most clearly associated with the presence of Clovis and Western Stemmed Tradition projectile points (Beck and Jones 2010). Recent investigations at the Cooper’s Ferry Site on the Salmon River in western Idaho, however, suggest the possibility that Paleoindian peoples were present in the region approximately 16,000 years B.P., well before the traditionally accepted timeframe associated with Clovis technology (Davis et al. 2019). The Cooper’s Ferry site is also known by the Nez Perce Tribe as an ancient village site named *Nipéhe*.

**Archaic Tradition (8,000-250 B.P.).** At the end of the Paleoindian Tradition nearly 8,000 years ago, environmental conditions in Idaho became warmer and drier, resulting in lifeway changes and, thus, changes in artifact assemblages (Butler 1978). An important addition to the assemblage was the introduction of the atlatl and associated corner- and side-notched projectile points. In addition, material items associated with an increasingly diverse and complex hunter-gatherer society emerged (Plew 2008). Reed et al. (1986) divided the Archaic Tradition into three subperiods: Early, Middle, and Late, each lasting nearly 3,000 years. Lower Johnson Creek contains several sites representative of the Early Archaic period in western Idaho (Forest Service 2010a).

**Ethnohistoric Period**

Ancestors of the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes were the aboriginal inhabitants of this region of Idaho. Their aboriginal territory covered parts of present-day Oregon, Washington, and Idaho. This area included several major river basins: the Columbia, the Salmon, the Snake, and the Clearwater (Indian Claims Commission 1961). The Nez Perce Tribe’s aboriginal territory and lifeways are associated with the Columbia Plateau, whereas the Shoshone-Bannock Tribes and Shoshone Paiute Tribes aboriginal territories and lifeways are associated with the Great Basin.

Prior to Euroamerican contact, the *Niimi’ipuu* (Nez Perce) were the dominant people of the Columbia Plateau, with a an estimated 17,000,000-acre territory in regions of Washington, Oregon, Montana, and Idaho, between the Cascade Range in the west to the Bitterroot Mountains in the east (Josephy 1971). Within the territory, several tribes from the Rockies in the east and the Pacific coast in the west were tied together via an extensive trade network. The *Niimi’ipuu* are part of the Sahaptin language family; they formed composite bands generally based on familial ties, language, and territory (Idaho Centennial Commission Native Americans Committee [ICCNAC] 1992; Walker 1982). The settlement and subsistence patterns of the *Niimi’ipuu* were varied and linked to resource distribution and environmental features (Churchill 1983). Anadromous fish, such as Chinook salmon, roots, such as camas, and a variety of game were, and continue to be, important subsistence resources (Hunn et al. 1998; Nez Perce Tribe 2019, 2020). The *Niimi’ipuu* engaged in fishing, hunting, and gathering across their vast aboriginal
territory, and these activities still play a major role in the culture, religion, subsistence, and commerce of the Nez Perce Tribe (Nez Perce 2017).

The Northern or Snake River Shoshone and Bannock, all part of the Numic language family, occupied an area generally along the Snake River Plain, but their territory also included most of southern Idaho, western Wyoming, and Montana, and south into Nevada and Utah (ICCNAC 1992; Murphy and Murphy 1986; Walker 1982). The Northern Paiutes left the Nevada and Utah regions for southern Idaho in the 1600s and traveled with the Shoshones in pursuit of bison; this band of Paiute became known as Bannocks (Shoshone-Bannock 2021). The northern portion of their territory in Idaho included present day Adams and Valley counties. The four Northern Shoshone band divisions included: (1) the Western Shoshone (Waareekas), including the Boise and the Bruneaus; (2) the Mountain Lemhi Shoshone, including the Dukudeka (Sheepeaters) and the Agaidikas (Salmoneaters); (3) the Northwestern Shoshone, including the Bear Lakes, Cache Valley, Bannock Creek, and Weber Ute; and (4) the Pohogue (Fort Hall) Shoshone (Forest Service and Bureau of Land Management 1997). The Newe (Shoshone-Bannock) traveled seasonally within their aboriginal territory, often visiting locations annually to gather and hunt (including fishing), among other practices throughout central Idaho’s Salmon River Mountains and other areas (Forest Service 2003a; Murphy and Murphy 1986). In the northern part of the territory were the Mountain Lemhi Shoshone, who wintered along the Lemhi River, a tributary of the SFSR. The Lemhi depended heavily on salmon runs in the Salmon River system for their subsistence. Fish were harvested either individually by harpoon or utilizing weirs across stream channels, basket traps, or seines and hand nets (Murphy and Murphy 1986). Important animals and plants for subsistence included salmon, deer, elk, moose, mountain sheep, bison, various nuts, seeds, berries, and roots, such as camas for food and osha/bear root for medicine. Small game animals, including, groundhog, jack rabbit, porcupines, and prairie dogs, also were used extensively especially in sagebrush steppe ecosystems (ICCNAC 1992; Walker 1982, 2019).

Ancestral bands of Western Shoshone and Northern Paiute traveled in small groups over a vast territory centered around southern Idaho, northern Nevada, and southeastern Oregon (Fowler and Liljeblad 1986; Thomas et al. 1986). The Dukudeka or Sheepeater band of Mountain Shoshone, a subset of Western Shoshone peoples, lived in parts of what is now the PNF Krassel District, McCall District, and the FCRNRW and the surrounding area and to the east into Montana and Wyoming. The Northern Paiute lived in two major bands in territories centering on the upper Snake and Owyhee Rivers, respectively. They used many of the same fishing and camas gathering areas as the Western Shoshone bands. Both the Western Shoshone and the Paiute were somewhat isolated by the Rocky Mountains and the Great Basin. They necessarily relied more on plant foods, such as sunflowers, wada seeds, currants, and huckleberries, plus small animals and insects. Much time was spent pursuing food based on seasonal cycles. In May, they left winter villages to gather roots and prepare salmon traps. At the end of the salmon runs, people dispersed to hunt and gather plants and insects. Communal rabbit and antelope drives and wada seed gathering occurred in early fall. By November, food had been stored, and the people returned to the winter villages (Walker 1982, 2019). More detailed tribal histories are provided in Section 3.24.

**Contact, Historic Period, and Modern Era**

The contact period is generally defined as beginning with the first Euroamerican and Native American contact. For this area, the Lewis and Clark Expedition of 1805 is most often referenced. Lewis and
Clark’s Corps of Discovery precipitated an era of rapid Euroamerican exploration and settlement, which advanced regionally with the arrival of early explorers, fur traders, and missionaries. Circa 1810, British and American fur trading posts were being established throughout the Pacific Northwest. However, contact was still limited in the remote mountains of central Idaho, but there were several meeting places known to the Euroamerican settlers and frontiersmen in Valley County, including an annual summer meeting at the north shore of Payette Lake where various indigenous peoples, including the Newe/Shoshone and the Niimi’ipuu/Nez Perce gathered.

By 1900, most members of the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes lived on reservations away from the mountains of central Idaho (Forest Service 2003a). However, the analysis area is still used by and of interest to these tribes (Battaglia 2018; Forest Service 2003a, 2010a; Lahren 2021; Walker 2019). More detailed tribal histories are provided in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q).

The communities of Yellow Pine and Roosevelt, as well as ranches along Johnson Creek, were first established in the early 1890s to support the mining boom in the nearby Big Creek area and the Thunder Mountain gold rush of the mid-1890s (Forest Service 2015c). Initial reports from the gold deposit at Thunder Mountain (the Dewey Mine) were very favorable, and, in 1902, its promise lured over 2,000 prospectors between 1902 and 1906, creating the boom town of Roosevelt. Thunder Mountain Road was established along a Native American travel corridor at this time to access Roosevelt from Emmett via Long Valley (Woods 2002). The mining boom at Thunder Mountain was short lived, as initial reports of the gold deposits were highly exaggerated. Mining ceased altogether in 1909 when a mudslide caused flooding and the subsequent evacuation and destruction of the community of Roosevelt. Thunder Mountain had a brief resurgence for a few years with an open pit at the Dewey Mine after gold prices had increased and access had been improved in the 1930s (McKay 2011).

The first work in the Stibnite-Yellow Pine Mining District, not to be confused with the smaller Stibnite Historic District, may have occurred as early as the 1860s, but the Stibnite area was not developed until after the turn of the 20th Century (Forest Service 2015c). Though ore deposits were discovered in the Stibnite area during the early 1900s in conjunction with the Thunder Mountain gold rush, Stibnite was more remote than other areas in the Stibnite-Yellow Pine Mining District, and, with the technology of the times, the gold and silver were difficult to separate from the antimony-gold-silver ore that was prevalent in the area.

There were two primary periods of heavy production in the Stibnite area: 1) a period encompassing World War I and World War II, which ended in the 1950s and 2) a period that began with exploratory activities in 1974 with intentions to re-open the historic mines, which led to open pit mining and seasonal on-off heap leaching through the 1990s (Midas Gold 2016a).

The community of Stibnite was established in the 1920s and substantially boomed during World War II when it swelled to a peak population of 1,500 permanent residents (Bertram 1986). The post office was established in Stibnite in 1927 and the community’s name was chosen because the town names of Meadow Creek and Bradley were already taken when Bailey applied for a post office (Bailey 1979; Woods 2002). Stibnite is an antimony sulfide, and the largest known deposits of that sulfide in the U.S. are found in the Stibnite-Yellow Pine Mining District (McKay 2011).
During World War II, the Stibnite mines were one of the nation’s leading producers of minerals needed in the war effort, including antimony and tungsten. The mines produced an estimated 90 percent of the nation’s domestic supply of antimony and 40 percent of its tungsten supply during this boom (Bertram 1986). By the end of the war, tungsten deposits were played out, and the mine continued with low-grade antimony and gold, but it was no longer profitable (Forest Service 2015c). By June 1952, production had ended, and, in 1957, mine operations ceased altogether. Beginning in 1954, homes and community buildings were abandoned or moved to Cascade, Yellow Pine, or McCall (Bertram 1986; Hart 1979; Mitchell 2000; Petersen 1999; Woods 2002).

In the 1970s, Ranchers Exploration and Development Company leased part of the mine at Stibnite, and plans were made to reopen it, but nothing happened until a decade later when Ranchers Exploration and Development Company merged with Hecla Mining Company and continued development work for a few more years. At the time, Hecla Mining Company negotiated a deal with Pioneer Metals to use their leach plant at Stibnite, and, by 1988, Yellow Pine Mine at Stibnite was producing the third-largest amount of gold in the state from open pit oxide ores mined in the Homestake area (northeast of the Yellow Pine pit) and at West End (Mitchell 2000). Waste rock from these operations was dumped close to these pits.

Throughout the 1980s and 1990s, several companies operated heap leach gold and silver facilities in the area around Meadow Creek near the former Stibnite mill and smelter location. Some of these leach pads have since been covered with fill, while the Hecla leach pad remains stacked with leached ore. Work under several different mining companies continued intermittently until 1997. This work left a deposit over 50 feet deep of spent heap leach ore in an area now known as the SODA, on top of the Bradley tailings. Exploration and evaluation work did not occur again until 2009 when affiliates of Perpetua began exploration work in the Hangar Flats area (Midas Gold 2016a).

**3.17.4.2 Heritage Resources Inventories**

In an effort to identify previously recorded heritage resources and previously conducted heritage resources surveys within the APEs, records searches were conducted by both the respective PNF and BNF Heritage Program staff and by Lahren (2020) on behalf of Midas Gold. A summary of the records searches and those results follow.

In April of 2012, a records search (#12221) from the Idaho SHPO to determine the presence or absence of previously recorded archaeological sites and the extent of survey coverage in and within 1 mile of the 2012 survey area, which focused on the mine area. The results of the 2012 SHPO records search were used, along with the results of the updated PNF and BNF records searches, to determine the number of investigations that have occurred in the analysis area. In total, this record search indicated that 53 archaeological investigations have been completed within the analysis area.

In November of 2021 and January of 2022, PNF staff requested a records search (#21462 and #22109, respectively) from the Idaho SHPO to update and augment the previous records searches performed for the SGP area. These included not only the SGP area but also other project components such as access roads and the associated transmission line corridor. The records searches included data from the Idaho Archaeological Inventory, the Idaho Historic Sites Inventory, and survey reports filed with the Idaho SHPO office. These records searches combined were conducted on the entire VAV APE to provide
adequate background information regarding heritage resources. A summary of the previous surveys is included in Appendix A of the SGP Heritage Resources Specialist Report (Forest Service 2022).

Recent surveys conducted within the APEs and associated with the SGP took place in 2018 and 2019, when AECOM conducted a re-evaluation of the Stibnite Historic District (Historic District); a survey of the 38.2-mile proposed Burntlog Route, and the 5.3-mile Riordan Creek reroute alignment. The final report of that fieldwork (AECOM 2020h) was submitted to the Idaho SHPO by the Forest Service. The Idaho SHPO responded with a concurrence letter on June 30, 2020 (Johansson 2020).

More recently, an archaeological survey was conducted under the CERCLA on the PNF in response to the 2021 ASAOC (EPA 2021d) for the mine site. The archaeological survey addressed activities including tailings removal, potential borrow areas, and water diversions in areas that had not been previously inventoried. As a result, 124.6 acres were inventoried (Hauer 2021). Eight archaeological sites were investigated (three new sites and five previously recorded sites) and the PNF has recommended that none of these sites are eligible for listing on the NRHP. The final report of findings was submitted to the PNF in December 2021. The report was submitted to the Idaho SHPO for review and concurrence in January 2022 and a response is pending.

The APEs encompass the Operations Area Boundary, which is defined as the area within which Perpetua would control public access. The Operations Area Boundary includes 14,221 acres of which over 12,000 acres has been inventoried for heritage resources, either through intensive pedestrian transects or reconnaissance survey if conditions were too steep or dangerous, previously disturbed conditions existed; therefore, over 80 percent of the Operations Area Boundary has been inventoried.

### 3.17.4.3 Heritage Resources

As identified through the records searches and as a result of the previous surveys documented with the SHPO through January 2022, a total of 240 heritage resources, including archaeological sites and above-ground resources, have been recorded in the APEs. Of the 240 heritage resources, 97 have been determined not eligible for listing on the NRHP and would require no further management. The remaining 143 sites, however, would require additional consideration and/or management if impacted by the SGP and its components and include 61 resources documented as eligible for listing on the NRHP, three National Register-listed resources, and 79 resources identified as unevaluated for listing on the NRHP. Further details on these sites can be found in the SGP Heritage Resources Specialist Report (Forest Service 2022).

Not all resources within the analysis area will be considered historic properties and may not be impacted by SGP activities dependent upon their eligibility and location. However, for purposes of the effects assessments, unevaluated resources will be treated as eligible until they are assessed in the field and eligibility determinations consulted with the Idaho SHPO and Native American tribal partners. Through consultation between the PNF and the Idaho SHPO office in 2020, the Stibnite/Meadow Creek Historic District (10VY262/85-335; NR Inventory #87001186) was re-evaluated for its NRHP eligibility and was determined to no longer be eligible for listing on the NRHP. The SHPO concurred with the PNF’s determination of no longer eligible for listing on the NRHP by letter dated January 27, 2021. No further
management consideration for the Stibnite Historic District or individual associated resources located within the historic district, as defined in the correspondence between the PNF and the SHPO, is required.

### 3.17.4.4 Traditional Cultural Properties and Cultural Landscapes

Ethnographic studies have been completed for the SGP by the Nez Perce Tribe (Battaglia 2018), the Shoshone-Paiute Tribes (Walker 2019), and the Shoshone-Bannock Tribes (Lahren 2020) to assist in identifying TCPs and CLs, as defined by the NPS. The Forest Service is in ongoing consultation with Tribes on how to appropriately publicly disclose information presented in the tribal ethnographic studies that identified potential TCPs or CLs within the analysis area for heritage resources.

The Nez Perce Tribe’s ethnography, reviewed by the Heritage Resources Program Manager, describes areas and resources that the Nez Perce Tribe is most concerned with and indicates the potential for TCPs and/or CLs to exist in the analysis area. However, specific TCPs or CLs, as defined by the NPS (NPS 2020; Parker and King 1998), are not currently disclosed to the public as they are considered confidential. General types of landscape features noted in the Nez Perce Tribe ethnography (Battaglia 2018) as having specific significance include: viewsheds and soundscapes, water and waterways, minerals, driftwood, culturally modified trees, hot springs, trails, and travel corridors. Further details regarding TCPs, CLs, and summaries of appropriate ethnographic data are presented in the Heritage Resources Specialist Report (Forest Service 2022).

The Shoshone-Paiute Tribes’ ethnography (Walker 2019) is framed as a broad overview of their cultural connection to the analysis area and does not go into specific locations of TCPs or CLs. However, general types of landscape features noted in the Shoshone-Paiute Tribes’ ethnography as having specific significance include: buttes; rock features and rock alignments; springs and hot springs; trails and travel routes; river and stream canyons; rock structures; valleys; and caves and rock shelters. The Shoshone-Paiute Tribes’ ethnography also identifies significant species of flora and fauna that may be located within the SGP APEs that are further detailed in the SGP Heritage Resources Specialist Report (Forest Service 2022).

The Shoshone-Bannock Tribes ethnography (Lahren 2020) identifies the SFSR and broader area as a cultural landscape that supports the hunting of salmon, gathering food, collecting berries, harvesting medicinal plants, and hunting big and small game, among other cultural practices. Details on other places of importance identified in the ethnography are presented in the SGP Heritage Resources Specialist Report (Forest Service 2022).

Currently, there are no TCPs or CLs as defined by the NPS and meeting NRHP eligibility criteria within the analysis area for heritage resources. However, the Forest Service will assess whether the tribal resources identified by the Tribes in the ethnographies meet the NPS definition of TCPs. The PA would include steps for identifying and documenting TCPs and CLs and a management plan for any such resources identified.
3.18 Public Health and Safety

3.18.1 Introduction

3.18.2 Public Health and Safety Area of Analysis

Public health and safety is related to the overall health and well-being of populations within the affects area of the SGP. The National Research Council guidance lists five general categories that should be addressed as part of a public health evaluation to systematically select the issues that need to be addressed for a project. These five categories are: environment, economy, infrastructure, services, and demographics. Five types of health impacts are assessed for each area (National Research Council 2011):

- **Chronic Disease**: For the purposes of this evaluation, chronic diseases are health conditions that persist for long periods of time (i.e., 3 months or longer) and are non-communicable, such as heart disease, cancer, or asthma.
- **Infectious Disease**: Infectious diseases are associated with viral, bacterial, or microbial infections and are commonly transferred from person to person through direct contact, such as influenza.
- **Injury**: Unintentional or accidental event resulting in injury or trauma, such as a car accident or fall.
- **Nutrition**: Impacts to health (positive or negative) associated with diet.
- **Well-being/psychosocial effects**: Well-being and psychosocial effects consider the social and cultural well-being of the populations.

Impacts to the environment are typically evaluated based on potential impacts to various environmental media (i.e., air, soil, groundwater, and surface water). This analysis focuses on whether hazardous pollutants could be emitted by activities of the SGP and enter environmental media at levels that could be a health concern. Health concern is evaluated by considering the amount of human exposure to potentially impacted environmental media. Human exposure to environmental media can occur through several pathways of exposure (e.g., inhalation of vapors or particulates in air, incidental ingestion or skin contact with impacted soils, and ingestion or skin contact with impacted groundwater or surface water).

In addition to hazards from pollutant-impacted environmental media, the existing terrain and characteristics of the environment can present certain natural hazards to public health and safety, such as:

- Geologic hazards (steep terrain, rock cliffs, avalanches, and landslides),
- Flash floods and water hazards, and
- Wildfires.

Economic conditions may have indirect impacts on health, as a result of the financial resources available to the local population or local government for health-related services.

Availability and changes to public services and infrastructure can have direct or indirect health benefits or consequences. For example, health benefits can occur if new water or sanitation systems reduce disease incidence rates for the local community. There may be negative impacts if new roads or transit corridors increase traffic accidents or negatively impact access to health-related services or activities.
Local demographics and the local population’s health status are relevant to this analysis, as some populations are more sensitive to project effects due to preexisting health conditions, access to health care, availability of health insurance (Gresenz and Escarce 2011; Hadley 2003; Hadley and Cunningham 2005; Newton et al. 2008), and the potential for increased stress or annoyance levels for populations living or recreating nearest to the mining areas due to noise or vehicle traffic.

### 3.18.3 Relevant Laws, Regulations, Policies, and Plans

While NEPA does not directly address effects on public health and safety, it does require that an integrated analysis of health effects be addressed for an environmental impacts analysis. The scope of this analysis is limited to affected communities outside of the Operations Area Boundary and associated facilities and does not include a direct evaluation of the anticipated workforce safety and health issues. All worker health issues are covered under the OSHA and the MSHA, as described below.

**Occupational Safety and Health Act of 1970** – This was passed to prevent workers from being killed or seriously harmed at work. This law created OSHA, which sets and enforces protective workplace safety and health standards. Under OSHA, employers have the responsibility to provide a safe workplace (OSHA 2019).


**The National Forest Land and Resource Management Plans** - These embody the provisions of the NFMA and guide natural resource management activities on NFS land. Physical, social, and biological resources on NFS lands are managed to achieve a desired condition that supports a broad range of biodiversity and social and economic opportunity. Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for public health and safety and include various objectives, guidelines, and standards for this purpose.

**Valley County Comprehensive Plan** - “The purpose of the Comprehensive Plan is not to control land, but to prevent uses of land harmful to the community in general.” The underlying objectives of the plan promote the health, safety, and general welfare of the people of Valley County, and aim to protect citizens from unsafe or unhealthy conditions caused by growth and development in the county (Valley County 2018a).

### 3.18.4 Affected Environment

Many natural and human-made public health and safety hazards are present in the analysis area, ranging from avalanches and wildfires to past and present storage and transportation of hazardous materials related to mine operations. Most of the analysis area is open to the public as most of the land is public land managed by the Forest Service.
Common users of the analysis area include Perpetua and Forest Service employees, residents of the village of Yellow Pine, tribal members, and recreationists. Recreation is a major use throughout much of the analysis area, and activities commonly include hunting, fishing, paddle boating, sightseeing, hiking, camping, all-terrain vehicle use, snowmobiling, and horseback riding. The remote nature of the analysis area presents numerous challenges for emergency operations, which include emergency management services and evacuation procedures.

The following section includes an assessment of the existing environmental conditions, socioeconomic conditions, public services and infrastructure related to public health and safety, and demographics with respect to land use and baseline community health conditions.

### 3.18.4.1 Environment and Health

Public health impacts associated with the environment could include exposure to pollutant-impacted media (e.g., air, soil, groundwater, and surface water), as well as potential physical hazards associated with the rugged, mountainous terrain in the analysis area. This section discusses the existing conditions of the environmental media and the physical terrain as they relate to public health and safety.

Baseline air quality measurements indicate current concentrations of the criteria air pollutants are well below the NAAQS for six criteria pollutants: particulate matter (including PM$_{10}$ and PM$_{2.5}$), SO$_2$, NO$_2$, O$_3$, lead, and CO. The NAAQS are allowable concentration limits adopted by the State of Idaho into the Rules for the Control of Air Pollution in Idaho. HAPs are pollutants that are known or suspected to cause cancer, other serious health effects, or adverse environmental effects. There are currently no permitted sources of HAP emissions under Title V of the CAA in the vicinity of the analysis area. Thus, the baseline concentrations of HAPs from human-made sources are likely within regulatory limits (Trinity Consultants 2017).

Reference area soil samples collected from undisturbed mineralized and non-mineralized zones near the mine site area indicated that concentrations of antimony and arsenic are consistently higher in samples collected from mineralized zones than in samples collected in non-mineralized zones (URS 2000b; Tetra Tech 2019a, 2021a). Sampling also showed elevated levels of arsenic, antimony, and mercury in areas disturbed by legacy mining relative to reference concentrations from both non-mineralized and mineralized zones. In 2003, the Agency for Toxic Substances and Disease Registry (ATSDR) completed a Public Health Assessment for the Stibnite/Yellow Pine Mining Area (ATSDR 2003). The assessment concluded that reasonable maximum exposure concentrations of arsenic and antimony in surface soil are unlikely to result in adverse public health effects for reclamation workers and recreational users of the site.

In addition to metals, soils may have been affected by historical spills of hazardous materials (such as petroleum hydrocarbons) now buried by legacy mine waste or natural deposition of eroded material. Current baseline conditions in the analysis area include limited use, transportation, and storage of hazardous materials and petroleum substances (e.g., diesel, gasoline, jet fuel, grease, and hydraulic oils) associated with Perpetua’s existing exploration activities. The analysis area could currently be impacted by accidental releases of hazardous materials during transportation, use, or disposal of these materials.
In groundwater samples from alluvial and bedrock wells, analytes concentrations generally met regulatory
criteria except for arsenic and antimony. Arsenic and antimony are considered the key chemicals of public
health concern in groundwater in the analysis area. Highest groundwater concentrations were noted in
wells directly downgradient of the legacy disturbed areas, with concentrations generally decreasing with
distance away from those areas.

There currently are no active domestic groundwater wells used for drinking water within 15 miles of the
Operations Area Boundary. Yellow Pine’s public water system uses surface water from Boulder Creek,
which is located approximately 15 miles downstream of the Operational Area Boundary and is a tributary
to the East Fork SFSR but drains an area unaffected by prior mining activities. Because groundwater in
the SGP area does not represent a drinking water source, the ATSDR Public Health Assessment
eliminated groundwater quality from consideration as a public health concern (ATSDR 2003). Any
potential future use of existing groundwater in the SGP would likely need to incorporate appropriate
filtration or water treatment systems to remove conditions of concern due to meet regulatory criteria.

Based on surface water sampling and analyses, antimony, arsenic, and mercury are considered the key
chemicals of public health interest in surface water in the analysis area and these constituents are naturally
elevated in the region (Brown and Caldwell 2017a). The ATSDR Public Health Assessment (ATSDR
2003) evaluated potential public health risk associated with exposure to contaminants in surface water
from the mine site and concluded that contaminants in surface water would be unlikely to result in
adverse health effects for recreational users in the existing mine site (ATSDR 2003). In addition, the
assessment concluded that for recreational fishers and even for local fishers from American Indian tribes,
who have higher fish consumption rates (estimated at 2.5 times other recreational fishers), consumption of
fish harvested from surface waters in the mine site is unlikely to result in any adverse health effects.

Common physical hazards related to terrain include extremely steep slopes, rock cliffs, uneven terrain,
and fallen trees. Avalanches, rock falls, debris flows, and flash floods also present a potential hazard for
travelers, recreationists, and Forest Service and Perpetua employees, and areas that are not traditionally
flood-prone are subject to changes to the landscape caused by wildfires. Notable landslides and
avalanches were experienced in 2014, 2017, 2019, and 2022 along the SFSR Road (FR 474/50674) and
the Stibnite portion of the McCall-Stibnite Road (CR 50-412).

Superimposed on the physical terrain, the Operations Area Boundary contains some dilapidated
structures, old mining equipment, underground mine openings (all collapsed and/or closed), and altered
landscapes, such as mine pits, abandoned and reclaimed townsites, abandoned and reclaimed mine and
exploration roads, hydroelectric generating foundations, municipal dumps at various locations, the
reclaimed Hecla heap leach pad, the spent ore disposal area, and waste rock disposal areas. Because most
of these hazards are on private land, unauthorized entry is considered trespassing, but these areas are
easily accessible to the public. Efforts have been made by Perpetua to mitigate potential public safety
issues related to these features. For example, “danger” and “no-trespassing” signs are posted near pits and
waste rock disposal facilities where terrain is steep and benches could be unstable. Efforts also have been
made to render old adits inaccessible by collapsing the entrances and posting warning signs. However,
numerous hazards still exist throughout the mine site, including discarded sharp, rusted metal objects,
foundation remnants, nails, glass, and other debris (HDR 2017n).

3.18.4.2 Economics and Health

Approximately 10 percent of Valley County residents are below the poverty level, and median household and per capita incomes in Valley County are slightly higher than the statewide averages, but the percentage of people not in the labor force in Valley County is relatively high at 50.5 percent (SGP Social and Economic Conditions Specialist Report, Forest Service 2022). The current economic ability to access health care is better than the Idaho statewide average.

3.18.4.3 Public Services/Infrastructure and Health

The analysis area is remote and limited services exist; most of the remaining mining infrastructure is abandoned. Significant improvements to off-site and on-site infrastructure would be necessary to support the proposed cleanup of legacy impacts and site reclamation, exploration, mining and ore processing, and closure. The following subsections summarize the existing infrastructure conditions and services most relevant to the public health and safety analysis.

Vehicle travel on FRs and CRs in the analysis area presents health and safety risks associated with traffic incidents. The analysis area experiences harsh weather conditions that pose potential travel hazards, especially during winter, when roads become snow-covered or icy. During winter, Valley County maintains only one route from Cascade to the analysis area, which follows Warm Lake Road (CR 10-579) to the intersection with SFSR Road (FR 474), then to the East Fork Stibnite Road portion of the McCall-Stibnite Road (CR 50-412) to the village of Yellow Pine. Perpetua maintains Stibnite Road (CR 50-412) for access from the village of Yellow Pine to the SGP. All other existing routes to the mine site are not maintained (plowed or sanded) when snow-covered roads become impassable to vehicles. Currently, Warm Lake Road (CR 10-579) has the highest incident rate (eight vehicle accidents per year) out of the FRs, CRs, and state highway in the Project vicinity.

Potential public health and safety hazards associated with transmission lines are from exposure to electromagnetic fields (EMF) and shock hazards. From the Lake Fork substation, there is an existing 42-mile-long 69-kV electric transmission line that passes through Cascade and connects with a substation near Warm Lake. Electricity for Yellow Pine is currently provided by an existing 21.5-mile-long 12.5-kV electric distribution line that connects to the Warm Lake substation. Idaho Power Company’s existing transmission line runs from its Lake Fork Substation south of McCall along its existing right-of-way to the Johnson Creek Airstrip. No power is currently supplied via a transmission line to the legacy mine site.

Direct contact with exposed or downed transmission lines could result in significant electrical shock. However, incidences of downed transmission lines occur rarely, typically the result of an accident, severe weather, or natural disaster. The magnetic fields generated by transmission lines can induce currents and voltages in nearby conductive objects such as metal fences, automobiles, and metal roofs or buildings that are close to transmission lines. The induced currents in these objects can result in a small electrical shock.
or a perceptible current when contacted by humans or animals. These small shocks are a nuisance, but do not cause physiological harm (NIEHS 2002).

Perpetua currently has and uses sanitary waste handling facilities at the exploration housing facility and other facilities that were approved by Valley County, IDEQ, and Idaho Department of Health and Human Services, namely packaged sewage treatment facilities, leach fields, and a recycling program that minimizes waste and trash delivery to area landfills (Midas 2016a).

In the event of a disaster or emergency, the local government’s primary responsibility is to respond to the incident to preserve life and property. Most of the analysis area is located more than 30 miles from the nearest local emergency services as it is 68 miles from Cascade and 50 miles from McCall, the two closest communities with hospitals. The emergency transportation service stations for Life Flights are in Boise, Idaho and Ontario, Oregon and service up to a 175-mile radius area. Recently, a new helipad was added in Yellow Pine for emergency transport via Life Flight (Yellow Pine Times 2019). No urgent care or medical facilities are located close to the Operations Area Boundary or Yellow Pine; however, there is a Cascade Fire/EMS Paramedic Ambulance Substation in Yellow Pine, which allows the community to administer First Aid and Advanced Life Support (Yellow Pine Times 2018).

Fire protection is provided by fire-fighting agencies and districts in Valley County that serve the communities of Cascade, Donnelly, McCall, and Yellow Pine as well as the rural areas surrounding these towns. These fire districts provide 24-hour fire protection for businesses and residents and are mostly staffed by volunteers. In the event of a catastrophic emergency, all the fire-fighting districts, the American Red Cross Valley County Chapter, and Valley County personnel join forces to compose the Valley County Fire Working Group Collaborative. For larger scale emergencies, local officials may implement emergency statutes and ordinances and declare a local state of emergency to mobilize and commit their resources. If local governments do not have sufficient resources to handle an emergency, they can request the support of the Idaho Emergency Operations Center, which developed the Idaho Emergency Operations Plan, a statewide comprehensive plan outlining disaster emergency response (Idaho Emergency Operations Center 2017).

### 3.18.4.4 Demographics and Health

As summarized in Table 3.18-1, Valley County ranks sixth best in the state for health outcomes, based on an equal weighting of length and quality of life. Valley County ranks fourth best in the state for overall health factors, based on weighted scores for health behaviors, clinical care, social and economic factors, and the physical environment.
Table 3.18-1  Valley County Health Ranking in the State of Idaho

<table>
<thead>
<tr>
<th>Valley County Measure of Health</th>
<th>2019 County Report Rank (out of 44)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Outcomes (overall)</td>
<td>6</td>
</tr>
<tr>
<td>Length of Life</td>
<td>14</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>1</td>
</tr>
<tr>
<td>Health Factors (overall)</td>
<td>4</td>
</tr>
<tr>
<td>Health Behaviors (tobacco, diet and exercise, alcohol use, high risk sexual behavior)</td>
<td>3</td>
</tr>
<tr>
<td>Clinical Care (Uninsured adults, primary care providers rate, preventable hospital stays, diabetic screenings)</td>
<td>2</td>
</tr>
<tr>
<td>Social and Economic Factors (education, employment, income, family and social support, community safety)</td>
<td>12</td>
</tr>
<tr>
<td>Physical Environment (air quality, built environment)</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: County Health Rankings and Roadmap 2019

3.19  Recreation

3.19.1  Introduction

This section describes recreation resources, including recreation opportunities, physical facilities, access for recreation, and the setting in which recreation activities occur within the analysis area. This section also describes existing recreation uses/users and recreation-related special use permits.

3.19.2  Recreation Resources Area of Analysis

As shown in Figure 3.19-1, the analysis area for direct and indirect impacts to recreation includes PNF MA 13 (Big Creek/Stibnite) and BNF MA 21 (Lower Johnson Creek), BNF MA 20 (Upper Johnson Creek), BNF MA 19 (Warm Lake), and a portion of BNF MA 17 (North Fork Payette River). The analysis area for recreation also includes a 5-mile radius from the major SGP components, and in some locations, extends outside the MA boundaries into the adjacent FCRNRW where recreation could be affected.

3.19.3  Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to Recreation. Additional descriptions of these regulations can be found in the SGP Recreation Specialist Report (Forest Service 2022m).

- **Land and Resource Management Plan:** National Forest Land and Resource Management Plans embody the provisions of the NFMA and guide natural resource management activities on NFS land. The Payette Forest Plan (Forest Service 2003a), the Boise Forest Plan (Forest Service 2010a), and the FCRNRW Plan (Forest Service 2009d) provide management prescriptions designed to realize goals for achieving desired condition for recreation and include various objectives, guidelines, and standards for this purpose.
Figure 3.19-1
Recreation Analysis Area
Stibnite Gold Project
Stibnite, ID

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua, State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

LEGEND
- Recreation Analysis Area
- Operations Area Boundary
- Other Features
  - U.S. Forest Service Wilderness
  - USFS Management Area
  - County
  - City/Town
  - Monumental Summit
  - Railroad
  - Highway
  - Road

Project Components
- Project Features
- Offsite Facility
- Existing Communication Tower
- New Cell Tower
- Stibnite Gold Logistics Facility

Base Layer: USGS Shaded Relief Service
Other Data Sources: Perpetua, State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

Figure 3.19-1 Recreation Analysis Area Stibnite Gold Project Stibnite, ID
Base Layer: USGS Shaded Relief Service Other Data Sources: Perpetua, State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest
National Forest Management Act: The NFMA directs the Forest Service through the forest planning process to provide for a variety of multiple uses, including recreation. To implement the terms of the NFMA, the Forest Service developed the ROS to ensure “a broad spectrum of dispersed and developed recreation opportunities,” which is described in further detail in Section 6.1.4, Recreation Setting (Forest Service 1982).

Executive Order 11017: As stated in the 1962 EO 11017, the Recreation Advisory Council shall include advice to the Federal agencies concerned with respect to the following aspects of outdoor recreation resources: “(1) the protection and appropriate management of scenic areas, natural wonders, primitive areas, historic sites, and recreation areas of national significance, (2) the management of Federal lands for the broadest possible recreation benefit consistent with other essential uses, (3) the management and improvement of fish and wildlife resources for recreational purposes, (4) cooperation with and assistance to the States and local governments, (5) interstate arrangements, including Federal participation where authorized and necessary, and (6) vigorous and cooperative leadership in a nationwide recreation effort.”

State of Idaho Local Land Use Planning Act (1972): As stated in Section 67-6502, the purpose of the State of Idaho Local Land Use Planning Act (1972) is, in part “to promote the health, safety, and general welfare of the people of the state of Idaho as follows: …10) to protect fish, wildlife, and recreation resources.”

Idaho Outfitters and Guides Act: The Idaho Outfitters and Guides Act (Title 36, Chapter 21, Idaho Code) requires a license as a prerequisite for conducting outfitting and guiding. Under the Act, the Idaho Outfitters and Guides Licensing Board (IOGLB) is responsible for determining the qualifications for outfitters and guides and issuing state licenses to commercial outfitters and guides in the State of Idaho.

Valley County Comprehensive Plan: The purpose of the Valley County Comprehensive Plan is to promote the health, safety, and general welfare of the people of the state of Idaho, and in part, to ensure the protection of “fish, wildlife, and recreation resources” (Valley County 2018a). The Valley County Comprehensive Plan also includes a Recreation and Open Space goal “To promote and support a viable recreation and tourism program …” (Valley County 2018a). Objectives include creating improvements for more varied recreation opportunities, promoting development of new recreation facilities when compatible with land use goals, and protecting access to public lands (Valley County 2018a).

City of Cascade Comprehensive Plan: The City of Cascade Comprehensive Plan (City of Cascade 2018) recognizes recreation and open space as management elements that set forth the community’s goals and objectives for expanded and enhanced recreational opportunities. One of the city’s goals is to “Expand recreation and open space varieties and opportunities.” The City of Cascade Comprehensive Plan recognizes the proximity of BNF recreational opportunities to residents and acknowledges that these recreational use areas are a major tourism driver.

3.19.4 Affected Environment

The analysis area is a popular area for a variety of recreation activities on both private and public lands. The village of Yellow Pine is located east of SH 55 in the analysis area, which offers limited services and had a year-round population of 32 in 2018 (Census 2018). There also is an unincorporated community in
the Big Creek/Edwardsburg area, which has residents during the summer (Forest Service 2003a). Figure 3.19-1 shows the recreation analysis area. The following sections describe the existing recreation opportunities, facilities, access, setting, use and users, and special use permits in the analysis area.

3.19.4.1 Recreation Opportunities

Summer and winter recreation opportunities are shown on Figures 6-1a through 6-1e and Figures 6-2a through 6-2e, respectively, in the Recreation Specialist Report (Forest Service 2022m). The analysis area includes over 170 miles of trails open to motorized use (Figures 6-3a and 6-3b of the Recreation Specialist Report [Forest Service 2022m]), of which over 60 percent are open to motorcycles and over 35 percent are open to vehicles 50 inches or less in width. Motorized recreation opportunities are available throughout the analysis area, including on trails in IRAs, which are predominantly in PNF MA 13 and BNF MAs 19, 20, and 21. In the winter, the Idaho Department of Parks and Recreation grooms over 96 miles of OSV trails in the analysis area. Snowmobiling is popular on these groomed OSV routes that branch off the plowed main routes through the analysis area (Figure 6-4 of the SGP Recreation Specialist Report [Forest Service 2022m]). Cross-country skiing opportunities are available in BNF MA 17 (Forest Service 2010a).

Summertime recreation opportunities such as hunting, fishing, hiking, camping, mountain biking, river recreation, and horseback riding are popular throughout the analysis area with opportunities available at both developed facilities (e.g., campgrounds and trails) and at dispersed locations (e.g., dispersed camping areas and specially designated areas). Warm Lake is a destination for water-related recreation, such as boating and swimming. Backpacking and pack trips are popular in the Big Creek area and from trailheads into the FCRNRW. Fishing opportunities are available throughout the analysis area, particularly at Johnson Creek, Warm Lake, South Fork Salmon River, and East Fork SFSR, for species such as salmon, steelhead, whitefish, and trout (Figure 6-1a through 6-1e of the SGP Recreation Specialist Report [Forest Service 2022m]).

3.19.4.2 Developed Recreation Facilities

The Warm Lake area contains most of the developed recreation facilities (apart from trailheads) in the analysis area. Forest Service campgrounds and other private recreation facilities also are located in the Big Creek and Landmark areas and along Johnson Creek Road around and south of Yellow Pine. Privately-owned recreation facilities also are located at Warm Lake and include lodges, organizational camps, and recreation residence tracts which are privately owned homes located on NFS lands. There is a lodge in the Big Creek area and one along Johnson Creek Road (Wapiti Meadow Ranch). Forest Service trailheads and trails are throughout the analysis area, several of which provide access to the FCRNRW, summarized below and described in further detail in the SGP Recreation Specialist Report (Forest Service 2022m).

Recreation facilities on NFS lands in the analysis area include 16 campgrounds, two dispersed camping areas, 28 trailheads, two interpretive sites, four lookouts/cabins, one boating site, one swimming site, and two wildlife viewing sites. The analysis area contains approximately 340 miles of developed trails, about 51 percent of which are open to motorized recreation use. Appendix A of the SGP Recreation Specialist Report (Forest Service 2022m) provides a list of the trails open to motorized vehicles, the trail length
within the analysis area, and the type of vehicles allowed on each trail. A total of 53 trails, about 49 percent of PNF and BNF developed trails (165 miles), are open for non-motorized trail use (biking, hiking, and/or horseback riding). Several of these trails are located adjacent to, or in, the FCRNRW, with trailheads located in PNF MA 13 and BNF Mas 20 and 21 providing access to trails in the FCRNRW, which are open to non-mechanized uses (e.g., hiking, backpacking, horseback riding). Appendix A of the SGP Recreation Specialist Report (Forest Service 2022m) provides a detailed list of all non-motorized trails in the analysis area.

Lake Cascade is located west of the existing IPCo transmission line corridor north and west of the BNF MA 17, accessible from a variety of roads located off SH 55 between Cascade and Donnelly. Lake Cascade State Park includes three-day use areas, two group day use areas, 12 campgrounds, and six boat ramps (Idaho Parks and Recreation 2021). The park is open year-round and provides opportunities for camping, picnicking, hiking, mountain biking, swimming, cycling, boating, sailing, windsurfing, fishing, snowshoeing, Nordic skiing, and ice fishing (Idaho Parks and Recreation 2019).

### 3.19.4.3 Recreation Access

Access to the analysis area is primarily via paved roads that lead to unpaved county and NFS roads and is summarized below. Additional detail on all access roads is provided in Appendix A of the Recreation Specialist Report (Forest Service 2022m). The main access roads (from west to east) include SH 55 and Warm Lake Road to Landmark. From Landmark, the main access roads are county-maintained gravel roads that travel north to Yellow Pine and farther to Big Creek. These roads include Johnson Creek Road and Warren-Profile Gap Road. Yellow Pine also can be reached from McCall via the county-maintained McCall-Stibnite Road.

From these main roads, connecting unpaved NFS roads provide access to NFS lands and facilities. Primary Forest Service access roads (from west to east) in the analysis area include SFSR Road, Burnt Log Road, Old Thunder Mountain Road, Meadow Creek Lookout Road, and Thunder Mountain Road. In total, there are approximately 460 miles of NFS roads in the analysis area open to all motorized vehicles year-round, and approximately 23 miles of NFS roads open to motorized vehicles seasonally (during the summer). Approximately eight miles of NFS roads are open to all vehicles during the summer (June 1 to September 15) but are open year-round to motor vehicles that are 50 inches wide or less.

In the winter (generally from November 1 to May 15), there are 96 miles of groomed OSV routes on 14 NFS roads in the analysis area. There also are approximately 4 miles of infrequently groomed OSV routes on Burnt Log Road and West Fork Creek Road. Approximately 10 miles of the SFSR Road are plowed in the winter.

In total, the analysis area also includes over 110 miles of local, county, state, and private roads that may be used for motorized recreation or to access NFS motorized recreation routes. Portions of several of these roads are plowed in the winter, allowing winter access to the analysis area. Some recreationists choose to fly into the area rather than drive. The closest public airstrips are the Johnson Creek airstrip in BNF MA 21 south of Yellow Pine and a public airstrip at Big Creek in PNF MA 13, which serve local landowners and recreationists (Forest Service 2003a).
Access and Transportation is discussed in further detail in the SGP Access and Transportation Specialist Report (Forest Service 2022k).

Recreation Setting

The management of recreation opportunities is accomplished by the Forest Service through use of the ROS, which is a system for classifying and managing recreation opportunities based on the physical setting, social setting, and managerial setting. The physical setting is defined by the type of access, the level of remoteness, and the size of the area. The social setting is defined by user density, including the amount and type of interaction between individuals (i.e., parties per day encountered). The managerial setting is defined by the level of visitor management (regulations and information), facilities and site management, and degree of naturalness.

The combination of the three settings results in six different ROS classes, described in Table 3.19-1. Because recreation access and type changes across seasons, ROS classification also may vary by season. For example, areas where motorized travel is prohibited during the summer may be open to OSV use during winter.

Table 3.19-1 Recreation Opportunity Spectrum Classes

<table>
<thead>
<tr>
<th>ROS Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primitive</td>
<td>Area characterized by essentially an unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and control. Motorized use in the area is not permitted.</td>
</tr>
<tr>
<td>Semi-Primitive Non-Motorized</td>
<td>Area is characterized by a natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but are subtle. Motorized use is not permitted.</td>
</tr>
<tr>
<td>Semi-Primitive Motorized</td>
<td>Area is characterized by a natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but are subtle. Motorized use is permitted.</td>
</tr>
<tr>
<td>Roaded Natural</td>
<td>Area is characterized by natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. Roaded Modified: A subset of Roaded Natural but includes a higher density of roads and may have management activities that dominate the landscape (Forest Service No Date).</td>
</tr>
<tr>
<td>Rural</td>
<td>Area is characterized by a substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sight and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate visitor densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.</td>
</tr>
</tbody>
</table>
Urban

Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resources modification and utilization practices are to enhance specific recreational activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans on-site are predominant. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motorized use and parking are available, with forms of mass transit often available to carry people throughout the site.

Source: AECOM 2020j; Forest Service 1982

### Designated ROS Classes

Figures 3.19-2 (Summer) and 3.19-3 (winter) show the existing designated ROS classes in the analysis area. The following text describes the applicable areas designated for each ROS category in the analysis area.

As discussed above, ROS classes can vary by season, which is the case in the analysis area. Designated summer ROS classes in the analysis area include Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive. Designated winter ROS classes in the analysis area include the same classes as the summer, with emphasis on Semi-Primitive Motorized. Acreages of designated summer and winter ROS classes within the analysis area are listed in detail in Appendix A of the SGP Recreation Specialist Report (Forest Service 2022m), and complete descriptions of the areas within each ROS class are provided in the same report.

### ROS Physical Setting

Physical setting of a ROS class is defined by the absence or presence of human sights and sounds, physical size of an area, and the amount of environmental modification caused by human activity (Forest Service 2003b). This setting is established through three criteria: remoteness, size of area, and evidence of humans. The physical setting criteria generally correspond to ROS classes; however, ROS physical settings are not always consistent with the overall ROS class because the influence of social and managerial settings is not considered in the physical settings. The criteria for how the ROS physical settings in the area of analysis were determined and refined is further described in the SGP Recreation Specialist Report (Forest Service 2022m). In summary, ROS physical settings were determined based on motorized and non-motorized travel routes, including roads, motorized trails, and railroads. Motorized physical settings were classified as either Semi-Primitive Motorized or Roaded Natural. Non-motorized areas were classified as either Primitive or Semi-Primitive Non-Motorized based on size criteria.

The analysis area experiences a shift in ROS physical setting between summer and winter, primarily due to limited accessibility due to snow-cover. Roads and trails are obscured to recreation users and snow-cover provides overland travel opportunities that are not available during summer. Development of the winter ROS physical setting was based on the PNF and BNF winter travel management and criteria. Access is highly restricted in the analysis area and limited routes are plowed throughout the winter to permit passenger cars. The estimated summer ROS physical settings vary from the designated ROS classes in some areas. Portions of the FCRNRW that are designated as Primitive or with no ROS GIS data but located in the wilderness were determined to have a physical setting of Semi-Primitive Non-Motorized based on the adjacent physical setting and size.
In the winter, the main difference between designated ROS classes and physical settings is along Stibnite Road, Johnson Creek Road, Warm Lake Road, and SFSR Road. The areas surrounding these roads are designated as Roaded Natural and Semi-Primitive Motorized but have physical settings of Rural because these routes are plowed during the winter (unplowed portions are Semi-Primitive Motorized Groomed). Another main difference between designated ROS classes and physical settings are that many areas that are designated Roaded Modified have a physical setting of Semi-Primitive Motorized; however, the areas designated as Semi-Primitive Non-Motorized also have a physical setting of Semi-Primitive Non-Motorized in the winter. Areas with a physical setting of Primitive in the winter are similar to those described above for the summer.

3.19.4.4 Recreation Use and Users

This section discusses general recreation uses throughout the analysis area. Developed recreation use is limited to the developed recreation sites (i.e., overnight facilities) located primarily in the Warm Lake, Landmark, and Johnson Creek Road areas. Most recreation in the analysis area is dispersed use, such as hunting, fishing, hiking, backpacking, and all-terrain vehicle use, which occurs outside of these developed recreation sites. Dispersed recreation use occurs year-round in the analysis area and is a primary use of all five management areas (Forest Service 2003a, 2010a). Motorized use typically occurs on NFS trails and roads while non-motorized uses generally occur in the FCRNRW, IRAs, and on non-motorized trails.

Although there are general visitation estimates available for the PNF (Fiscal Year 2018) and BNF (Fiscal Year 2019) as part of the National Visitor Use Monitoring Program, visitor use estimates are not available for specific management areas in the PNF or BNF in the analysis area; therefore, the information below represents visits for the entire PNF and BNF and not just the analysis area. Based on estimates from the National Visitor Use Monitoring data, undeveloped areas received over 50 percent of the estimated visits in both forests. Developed area use was higher in both forests at developed day use sites than at developed overnight sites. Use at developed day use areas was about 32 percent of visits for both PNF and BNF compared to overnight use, which was about 5 percent of visits for PNF and 11 percent of visits for BNF. There were no FCRNRW visits estimated at BNF. However, at PNF, FCRNRW use accounted for about 1 percent of total visits. Overall, the BNF was estimated to receive over 2.5 times more visits than the PNF (Forest Service 2019h, 2020f, 2020g, 2021a).

Recreation is considered a major use in the Big Creek area of PNF MA 13 (Forest Service 2003a), while the “remainder of the management area receives low to moderate dispersed use associated mainly with the Big Creek/Edwardsburg area, Missouri Ridge and Monumental Creek Trails into the FCRNRW, and high mountain lakes in the upper Profile Creek drainage” (Forest Service 2003a). As noted in the Payette Forest Plan for PNF MA 13, though most use is local, “users come through the area from all over the country to use the adjacent FCRNRW, especially during big-game hunting seasons” (Forest Service 2003a).
Figure 3.19-2
Existing Conditions
Recreation Opportunity Spectrum Summer
Stibnite Gold Project
Stibnite, ID
Other Data Sources: Midas Gold; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette

Legend

Recreation Opportunity Spectrum (Summer)
-Primitive
-Rural
-Roaded Modified
-Roaded Natural
Semi-Primitive Motorized
Semi-Primitive Non-Motorized
No ROS Data
Recreation Analysis Area

Other Features
-U.S. Forest Service
-Wilderness
-County
-City/Town
-Monumental Summit

Boise National Forest
Payette National Forest
Idaho County
Valley County
Custer County
Stibnite Gold Project
Stibnite, ID

Project Area

1 inch = 10 miles when printed at 8.5x11 in
**Hunting**

The IDFG has divided the state into 78 GMUs to aid in wildlife and hunting management. The five management areas in the analysis area overlap three IDFG GMUs: 24, 25, and 26 (Figure 3.19-1). Collectively, these GMUs were used by approximately 7,370 hunters, and 1,288 big game individuals were harvested. GMU 24 is the most used compared to GMU 25 and 26. In GMU 24, 330 deer, 336 elk, 106 black bear, one mountain lion, and three wolves were harvested, and this GMU supported approximately 4,569 hunters. Compared to all GMUs throughout Idaho, GMU 24 ranks 21st in deer hunter usage, 35th in deer harvest, 12th in elk hunter usage, 18th in elk harvest, and 9th in black bear harvest. GMU 25 and 26 were used far less with hunter usage ranking ranged from 23rd to 87th and harvest total ranking ranged from 36th to 85th depending on the species. Much of the hunting within Idaho can be done by purchasing over the counter general tags, and many species (e.g., black bear, mountain lion, and turkey) do not have tag limits. Deer (i.e., Whitetail and Mule) and elk have tag limits in some instances. For nonresident hunters, there are 195, 77, and 155 tags available in GMU 24, 25, and 26, respectively (IDFG 2021a). Elk are managed by IDFG using Elk Zones. There are two Elk Zones (i.e., McCall and Middle Fork) within the analysis area, which also contain several GMUs outside of the analysis area. The McCall Zone contains four GMUs: 19A, 23, 24, and 25, which has 816 nonresident tags. The Middle Fork Zone contains three GMUs: 20A, 26, and 27, which has 3,187 nonresident and resident tags (IDFG 2021b, c). Additionally, there are 24 outfitters and guides permitted in GMU 24, 14 permitted in GMU 25, and 37 permitted in GMU 26 (IOGLB 2020a-c). GMU 26 is primarily in the FCRNRW and includes a portion of PNF MA 13. Only BNF MA 17 is in GMU 24. BNF MAs 19, 20, and 21, and most of PNF MA 13 are in GMU 25 (Figure 3.19-1).

**Fishing**

There are many fishing opportunities throughout the analysis area in lakes, streams, rivers, and reservoirs (Figures 6-1a through 6-1e of the SGP Recreation Specialist Report [Forest Service 2022m]). The BNF river and stream fishing as well as lake and pond fishing throughout the district are noted as excellent for fishing. The IDFG oversees fishing licenses for the State of Idaho, and the analysis area falls within the IDFG Southwest Region. Fishing licenses are required and can be purchased at many local dealers or through the IDFG. There are many species of fish for harvest within the IDFG Southwest Region, details of the species available, special rules by species, as well as limits by species can be found is the Idaho Fishing Season and Rules (IDFG 2021d).

**Mountain Biking**

Mountain biking is available throughout the analysis area. Mountain biking is allowed on both open and gated forest roads, as well as trails open to non-motorized uses (Figures 6-3a and 6-3b of the SGP Recreation Specialist Report [Forest Service 2022m]). Cross-country travel via a mountain bike is not permitted (USDA BNF 2021a, USDA PNF 2021a).

**Recreational River Use**

User data for recreational river use (e.g., paddle boating, float boating, kayaking) in this area is not tracked by the Forest Service on the Payette River. Both day use and annual river passes are sold through
vendors but not all users purchase day use passes. Annual passes don’t represent actual physical presence on the rivers in days. Annual Passes admit up to four adults (people ages 15 and younger are free), so four adults and up to 70 children can be admitted for an annual pass. Any use above 75 people requires a special use permit for group activities (USDA BNF 2021b). Recreational river use is mostly in the SFSR with up to 100 permits issued. Use of the East Fork SFSR is minimal but does occur and does not require a permit.

**Horseback Riding**

Motorized and non-motorized trails throughout the district are available for use for horseback riding, but there are no trails solely dedicated to horseback riding in the BNF (USDA BNF 2021c).

**Hiking**

Numerous trails are available for day hiking and backpacking throughout the analysis area. The Forest Service provides details on the trails including location, use, distance, and terrain on interactive websites for each management area (USDA BNF 2021d, USDA PNF 2021b).

**Winter Use**

Winter use in the analysis area includes backcountry skiing/snowboarding, snowmobiling, and cross-country skiing, and snowshoeing. Winter travel routes including OSV routes and parking areas are shown on Figure 6-4 of the SGP Recreation Specialist Report (Forest Service 2022m). Neither the BNF nor PNF require permits for backcountry skiing. Idaho State Parks and Recreations passes are available for a three-day park and ski pass. Revenues from the sale of permits are utilized for trail improvements, plowing parking lots, and grooming trails (Forest Service 2022m). Snowmobiling also takes place throughout the analysis area on both groomed and ungroomed routes. Additional details on snowmobile areas and routes can be found on the BNF and PNF websites (USDA BNF 2021e, USDA PNF 2021c). As noted in Section 3.2.4.7, there are 18 avalanche paths potentially affecting 1.6 miles of the road along the proposed OSV route (DAC 2021; Figure 3.2-6). The relatively high snowfall along this route suggests that most of these paths are expected to produce D2-sized avalanches on an annual basis with potential D3 avalanches with a 10- to 30-year return period. This area is outside of current avalanche forecasting areas (Forest Service, Todd Leeds, personal communication).

**3.19.4.5 Special Recreation Use Permits**

The IOGLB issues state licenses to commercial outfitters and guides in the state of Idaho and is responsible for the administration of the Idaho Outfitters and Guides Act (Title 35, Chapter 21, Idaho Code), while the Forest Service authorizes outfitter/guide services and facilities on NFS lands.

There are 24 outfitters and guides permitted in GMU 24, 14 permitted in GMU 25, and 37 permitted in GMU 26 (IOGLB 2020a-c). GMU 26 is primarily in the FCRNRW and includes a portion of PNF MA 13. Only BNF MA 17 is in GMU 24. BNF MAs 19, 20, and 21, and most of PNF MA 13 are in GMU 25.

In all three GMUs, activities permitted by the IOGLB, which vary by outfitter, include trail rides/pack trips, mountain bike touring, backpacking, photo trips, day hikes, snowmobiling, and fishing. In GMUs
24 and 25, permitted activities also include llama packing and skiing/snowshoeing. The IOGLB also has permitted kayaking and float boating in GMUs 24 and 26. In GMU 24, wagon/sleigh rides, zip line tours, mountaineering, and power boating also are permitted.

In the three GMUs, several of the permitted outfitters also are permitted for hunting (five in GMU 24, nine in GMU 25, and 26 in GMU 26). In all three GMUs, outfitters are permitted to hunt bear, cougar, predators, wolf, elk, deer, moose, and forest grouse (species vary by outfitter).

In 2019, there were several recreation-related special use permits issued by the Forest Service for the PNF and BNF portions of the analysis area. Appendix A of the SGP Recreation Specialist Report (Forest Service 2022m) describes each of the current recreation-related special use permits that have been issued within the analysis area.

### 3.20 Scenic Resources

#### 3.20.1 Introduction

Scenic resources are the visible physical features on the landscape (e.g., land, water, vegetation, structures, and other features). Scenic resources in the area of analysis (Figure 3.20-1) are characterized as a continuous mountain landscape broken occasionally by wide valleys with flat or hilly floors. The FCRNRW is renowned for its rugged and wild character. Its designation as a wilderness makes it, at a minimum, regionally significant.

#### 3.20.2 Scenic Resources Area of Analysis

The analysis area for scenic resources is not a definitive boundary as it includes all areas where the SGP would potentially be visible to the public. The analysis area generally extends north of and along the East Fork Road segment and the Stibnite Road segment of the McCall-Stibnite Road (CR 50-412), to the east into portions of the FCRNRW, south of and along Warm Lake Road (CR 10-579), and west of Lake Cascade, and represents a 25-mile viewshed analysis area (Figure 3.20-1).

#### 3.20.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and regulations apply to the Proposed Action and Action Alternative. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to scenic resources. Additional descriptions of these regulations can be found in the SGP Scenic Resources Specialist Report (Forest Service 2022n).

**Forest Service:** The Payette Forest Plan and Boise Forest Plan (Forest Service 2003a, 2010a) each state that the desired condition for the scenic environment is that “scenic quality is maintained or enhanced in areas of high scenic value and other highly used recreation areas.”

**Bureau of Reclamation:** The BOR Lake Cascade Resource Management Plan (BOR 2002) includes Goals and Objectives that pertain to Scenic Resources on land that it manages.
National Environmental Policy Act: Scenic quality is a measure of the visual appeal of a parcel of land. Section 101(b) of the NEPA states that the Federal Government should use all practical means to assure aesthetically pleasing surroundings be retained for all Americans (42 USC 4331.101[b][2]).

Valley County Comprehension Plan: The purpose of the Valley County Comprehensive Plan is to promote the health, safety, and general welfare of the people of the State of Idaho, in part, to ensure that “the development on land is commensurate with the physical characteristics of the land” (Valley County 2018a). The plan contains land use goals related to scenic resources and the rural character of the landscape.

Payette River National Scenic Byway: The Payette River Scenic Byway (PRSB) Corridor Management Plan notes that the PRSB Advisory Council does not have regulatory authority and relies on Valley County and the communities along the corridor to preserve the scenic qualities of the PRSB (PRSB Advisory Council 2013). The plan does not specify guidance with regard to scenic resource management along the corridor; however, the PRSB Advisory Council “will collectively review all zoning ordinance proposals to determine if the ordinances support principal goals by preserving historic or culturally valuable assets and viewsheds, [and] limit undesired land uses within close proximity of the byway…”

City of Cascade: The City of Cascade Comprehensive Plan (City of Cascade 2017) recognizes Natural Resources as a management element that includes scenic resources as part of Goal 4.1, which states, “Protect wildlife habitat, the environmental and hydrologic functions of lands and streams, and scenic vistas.” The City of Cascade Comprehensive Plan also identifies SH 55 (PRSB) as a scenic corridor with qualities that attract visitors. It also identifies mountain ranges surrounding Cascade and the riparian corridor along Payette River as critical areas for scenic resources.

City of Donnelly: The City of Donnelly Comprehensive Plan (City of Donnelly 2014) identifies goals and policies related to Community Design. One of the city’s goals is to, “Preserve and enhance the visual appearance and unique character of the City,” and its second objective is to “Preserve and enhance the landscape views around the City.” Policy 3 states that, “Utilities shall be installed underground whenever possible to minimize visual impacts.” Goals and policies related to Public Services and Utilities includes the following objective, “Provide adequate public utility infrastructure to meet the needs of current and future residents while minimizing its visual impact.”

Forest Service Visual Management System: This system has been used since the mid-1970s to determine effects to scenery from proposed activities and is the basis of this analysis. The BNF and PNF lands have been inventoried in accordance with the Visual Management System (VMS) (Forest Service 1974b).

Combining these attributes, national forests that utilize the VMS assign a VQO to be used during project planning and implementation for the purpose of maintaining or enhancing the scenic qualities of the forest’s landscapes. VQOs are measurable standards or objectives that guide management of these lands and represent different degrees of acceptable alterations to national forest landscapes (Forest Service 1974b). The VQO categories include Preservation, Retention, Partial Retention, Modification, and Maximum modification.
Figure 3.20-1  Scenic Resources Viewshed Analysis Area  Stibnite Gold Project Stibnite, ID

Legend

KOP & Simulation
KOP
Scenic Resources 25-mile Viewshed Area
Project Components

SPG Features
Operations Area Boundary

Burntlog Maintenance Facility *
Landmark Maintenance Facility **
Stibnite Gold Logistics Facility

Burntlog Route *
Johnson Creek Route

Utilities

-•- Upgraded Transmission Line
-.- New Transmission Line

Existing Substation ***
Existing Communication Tower

Other Features

U.S. Forest Service
Wilderness

County
City/Town

Monumental Summit
Railroad
Highway
Road
Stream/River
Lake/Reservoir

* Associated only with 2021 MMP
** Associated only with Johnson Creek Route Alternative
*** Substation locations are approximate
**LEGEND**

- Visual Quality Objectives
  - Preservation
  - Retention
  - Partial Retention
  - Modification
  - Maximum Modification

- Project Components
  - SPG Features
    - Operations Area Boundary
    - Burntlog Maintenance Facility *
    - Landmark Maintenance Facility **
    - Stibnite Gold Logistics Facility
  - Burntlog Route *
  - Johnson Creek Route

- Utilities
  - Upgraded Transmission Line
  - New Transmission Line
  - Existing Substation ***
  - Existing Communication Tower

- Other Features
  - U.S. Forest Service
  - Wilderness
  - County
  - City/Town
  - Monumental Summit
  - Railroad
  - Highway
  - Road
  - Stream/River
  - Lake/Reservoir

*Associated only with 2021 MMP*
**Associated only with Johnson Creek Route*
***Substation locations are approximate***

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**Figure 3.20-2**

**Visual Quality Objectives**

Within Analysis Area

Stibnite Gold Project

Stibnite, ID

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**Base Layer:** USGS Shaded Relief Service

**Other Data Sources:** Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest

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1 inch = 4.5 miles when printed at 11x17

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In general, VQOs for highly scenic and/or highly sensitive and visible landscapes require the retention of a natural appearance yet would allow for activities with a low level of visual change. A greater degree of landscape alteration is acceptable in landscapes that are inherently less scenic, seen from a greater distance, or seen from less sensitive locations.

### 3.20.4 Affected Environment

Of the VQOs assigned to the analysis area in the Payette Forest Plan and Boise Forest Plan, approximately 42,725 acres are identified as **Preservation**, 84,073 acres are identified as **Retention**, 178,118 acres are identified as **Partial Retention**, 19,709 acres are identified as **Modification**, and 1,272 acres are identified as **Maximum Modification**. The remaining 218,945 acres within the analysis area are either private, state, or other (non-Forest Service) federal land that do not have assigned VQOs. **Figure 3.20-2** illustrates these locations in the SGP vicinity.

Data sources used to select representative Key Observation Points (KOPs) (**Figure 3.20-1**) included: viewshed analysis results, existing land use plans, recreation data, aerial photography, and Forest Plan VQO data. These data were reviewed in conjunction with the proposed SGP components to provide a comprehensive evaluation of the varied components and their potential impacts to sensitive viewer locations within the analysis area.

#### 3.20.4.1 Characteristic Landscape

Visual sensitivity pertains to the degree of concern for changes to the characteristic landscape. Sensitive use areas were identified based on the following criteria: use duration, use volume, Forest Plan sensitivity level, and scenic or special designation. Existing conditions of sensitive use areas are summarized in the text below. All areas identified as sensitive use areas in this analysis have an overall sensitivity of high or moderate.

**Travel Routes** - There are 27 roads, including highways, forest roads, and local roads, in the analysis area identified as sensitive use areas. These roads provide access for forest visitors to the two national forests, the FCRNRW, the SGP, recreation sites that include Warm Lake and the Stolle Cabin, and numerous campgrounds and trailheads, as well as serve as travel routes for the residents of the village of Yellow Pine. Most roads are seasonal and closed during winter months due to snow. However, Stibnite Road (CR 50-412), Warm Lake Road (CR 10-579), SFSR Road (FR 474/50674), and the northern portion of Johnson Creek Road (CR 10-413) are accessible to vehicles year-round. Views experienced from travel routes are transient in nature and include “superior” (views from above), “inferior” (views from below), and enclosed views; although, expanded views exist in areas where adjacent vegetation is sparse and/or low growing. Six KOPs (4, 10, 13, 14, 15, and 16) are identified along travel routes (**Figure 3.20-1**).

**Waterbodies** - There are six rivers and creeks and two lakes (Warm Lake and Lake Cascade) in the analysis area identified as sensitive use areas that are used by residents and forest visitors for motorized boating, rafting, swimming, wildlife viewing, and fishing. Near the SGP, the East Fork SFSR is accessible for dispersed recreation. Johnson Creek is accessible for water-based recreation at numerous campgrounds and dispersed campsites throughout the analysis area. Summit Lake, Caton Lake, Rainbow Lake, Curtis Lake, Black Lake, and Riordan Lake are other major bodies of water that are accessible for
dispersed recreation. Johnson Creek and Burntlog Creek are eligible for designation as WSRs (recreational and wild, respectively), and the South Fork of the Salmon River is suitable for designation as a recreational WSR. Warm Lake, Horsethief Reservoir, Lake Cascade, and the North Fork of the Payette River are also located in the analysis area and offer several recreation amenities, including campgrounds and boat launching sites. Views experienced from waterbodies include transient (from watercraft) or stationary (from the shore) and are typically inferior and enclosed to partially enclosed, meaning expansive views of adjacent scenery are not present. No KOPs were identified on or along waterbodies.

Campgrounds and Lodging - There are 16 campgrounds in the analysis area: 11 are NFS campgrounds and the remaining five campgrounds and lodging facilities are non-Forest Service facilities. Many of the campgrounds provide access to hiking trails and rivers or streams for fishing and recreational activities. There are also three dispersed campsites in the analysis area. Views experienced from campgrounds and other lodging areas are stationary and typically inferior and enclosed or partially enclosed. One KOP is identified at a campground (KOP 8) and two at dispersed camp sites (KOPs 6 and 12).

Trails and Trailheads - There are numerous trails and trailheads throughout the analysis area, although notably fewer in the northern portion. The Idaho Centennial Trail is a 900-mile state-designated trail that includes motorized and non-motorized trails on the PNF and BNF. Lookout Mountain Trailhead is a supply drop location for Idaho Centennial Trail and wilderness users. Trails traverse through the forests and cross through the analysis area providing access to the FCRNRW, lakes, rivers, lookouts, campgrounds, and other various features and provide opportunities for viewing wildlife and scenery, including the FCRNRW. Views experienced from trails are transient or stationary and include superior, inferior, enclosed, and panoramic views. Four KOPs are identified along Forest Service trails (KOPs 2, 3, 7, and 9) and two at trailheads (KOPs 5 and 11).

Other Recreational Uses - Other recreational use sites in the analysis area include interpretive sites, viewpoints, lookouts, swimming sites, picnic areas, and wildlife viewpoints. The Stibnite Interpretive site is located at the old Stibnite home foundations near the SGP and includes informational signage describing the past history of the town of Stibnite and mining in the area. There also is an interpretive site at Landmark that describes the historic ranger station established in 1924. Monumental Summit is a viewpoint offering 360-degree views of the forest and neighboring FCRNRW area. There are two lookouts: Meadow Creek Lookout and Thunderbolt Mountain Lookout. Warm Lake hosts the Billy Rice Swimming Site, and the Warm Lake Picnic Point is on a small peninsula, which offers expansive views of Warm Lake and hosts a small organization’s camp. South of Warm Lake, along SFSR Road (FR 50474), there is a point of interest for visitors to view wild salmon. Views experienced from other recreational areas are transient or stationary and include superior, inferior, enclosed, and panoramic views. One KOP is identified at Meadow Creek Lookout (KOP 1).

Residences - Residences in the analysis area were inventoried as high sensitivity, due to duration of views and concern for changes in the landscape. The village of Yellow Pine is located approximately 14 miles west of the proposed SGP at the junction of Stibnite Road (CR 50-412) and Johnson Creek Road (CR 10-413). This small community, which had a year-round population of 32 in 2018, is the nearest residential area to the SGP (Census 2018). Dispersed rural residences are generally located along Johnson Creek Road (CR 10-413) on private lands adjacent to the creek. These include Wapiti Meadows, Cox Ranch, and Bryant Ranch. The largest concentration of residential viewers on NFS lands within the analysis area...
is Warm Lake. The Warm Lake area has several seasonal residences in the Paradise Valley Summer Homes and Warm Lake Summer Homes areas. There are a few dispersed rural residences on private land off Warm Lake Highway near Scott Valley. The cities of Cascade and Donnelly are located in Long Valley near Lake Cascade and the North Fork Payette River. Several rural residences and ranches are in Long Valley, and Cascade serves as the primary logging and ranching center for residents. Several residences are located along Lake Cascade on private lands. Donnelly is at the upper end of Lake Cascade and provides access and support services to the lake and residents in the surrounding area. One KOP has been identified near the residences at Cascade (KOP 17).

3.20.4.2 Key Observation Points

The KOPs represent different types of sensitive use areas (roads, trails, recreation use areas, and residential areas) and areas where different SGP components could be visible. Existing conditions are assessed at each KOP and used to evaluate potential impacts from the SGP. Photographs taken from select KOPs are available in Appendix A of the SGP Scenic Resources Specialist Report (Forest Service 2022n).

**KOP 1: Meadow Creek Lookout**

KOP 1 represents views experienced from Meadow Creek Lookout, directed northeast. Meadow Creek Lookout is not frequently visited by the general public due to its remoteness; however, it is one of the few recreational use areas with unobstructed superior (viewed from above) views of the SGP. This location represents a moderate-sensitivity viewpoint that Forest Service staff and recreational users would see when accessing this lookout through Meadow Creek Lookout Road (FR 51290) and/or nearby Meadow Creek/Summit Trailhead and NFST 073. These areas are as level 2 sensitive use areas, which are associated with a moderate level of visual sensitivity (Forest Service 2010a).

**KOP 2: Frank Church-River of No Return Wilderness – Summit Trail (NFST 088)**

Summit Trail offers panoramic views of the Salmon River Mountains and wilderness area for the entire length of the trail between Snowshoe Summit up to Meadow Ridge. This KOP represents what moderate sensitivity recreation users (hikers, horseback riders) would see from a non-motorized trail at the edge of the wilderness. Similar to Meadow Creek Lookout, this area is not frequented by many visitors because of its remoteness; and is associated with a moderate level of sensitivity which is consistent for similar trails in this area. This trail crosses areas designated as roadless and existing views of the characteristic landscape are typically limited to dispersed recreation such as hiking or horseback riding.

**KOP 3: Frank Church-River of No Return Wilderness – Mule Hill Trail (NFST 219)**

KOP 3 at Mule Hill Trail is accessible from Meadow Creek Lookout Road (FR 51290) and provides access to the Indian Creek Trail. This viewpoint represents what high sensitivity recreation users (hikers, horseback riders) might see from a trail within the wilderness.
**KOP 4: Stibnite Road (CR 50-412)**

KOP 4 represents views experienced from the Stibnite Road portion of McCall-Stibnite Road (CR 50-412) directed east-southeast. Stibnite Road (CR 50-412) is a sensitivity level 1 travel route that provides access to the SGP through the village of Yellow Pine. This road also provides access to Thunder Mountain Road (FR 50375) through the proposed SGP, and this viewpoint represents typical views that travelers would see from Stibnite Road (CR 50-412). Previous disturbance from legacy mining activities is evident in the foreground, including light soil color contrasts from landform modifications.

**KOP 5: Hennessey Meadow Trailhead**

KOP 5 represents views from Hennessey Meadow Trailhead looking east toward the proposed transmission line corridor. Hennessey Meadow Trailhead is at the end of Horse Heaven Road (FR 416W), which is a high-clearance vehicle travel route that follows Riordan Creek. This trailhead provides access to NFST 097 which leads to Riordan Lake, a popular fishing location in the area; and NFST 233. At this location, NFST 233 traverses extremely steep terrain that is primarily accessible by experienced OHV users and may receive limited use due to this factor. This trailhead is associated with moderate sensitivity and is a typical viewpoint for motorized vehicle recreational users in the area. The past transmission line ROW corridor is evident, although structures are not present.

**KOP 6: Twin Bridges Dispersed Camping Area**

KOP 6 represents views from Twin Bridges dispersed camping area looking south toward the proposed upgraded transmission line. Twin Bridges dispersed camping area is between Johnson Creek and the existing transmission line corridor, with Johnson Creek Road (CR 10-413) immediately west of the existing transmission line. This dispersed camping area is associated with moderate visual sensitivity. This viewing location is representative of dispersed recreational viewers in the area, with views of the existing transmission line. Screening is limited, and the modifications associated with the existing ROW are co-dominant in the landscape due to the enclosed landscape setting. Human development is limited to existing roads and the transmission line ROW.

**KOP 7: Idaho Centennial Trail at Johnson Creek Road (CR 10-413) and Burntlog Creek Trail (NFST 075)**

KOP 7 represents views from the Idaho Centennial Trail (ICT) directed west toward Burnt Log Road (FR 447). The ICT follows the Burntlog Creek Trail (NFST 075) heading north to the junction of Johnson Creek Road (CR 10-413). This trail is identified as a sensitive level 1 use area and is associated with high visual sensitivity. This KOP represents a typical ICT trail user in the analysis area with views of the transmission line. Recreational viewers associated with this viewpoint currently have unobstructed views of the transmission line, primarily due to ROW vegetation clearing. Modifications near the trail are limited to existing roads and the transmission line ROW.

**KOP 8: Trout Creek Campground**

KOP 8 represents the view from Trout Creek Campground looking west. Trout Creek Campground is off Johnson Creek Road (CR 10-413) just southeast of the existing transmission line corridor. This
campground is a sensitive level 1 use area, with developed amenities including fire pits, picnic benches, and restrooms. This viewing location is representative of campers in the analysis area that would have views of the existing transmission line corridor. The existing transmission line corridor is immediately adjacent to the campsite, and screening is limited to a few rows of trees at this site. Although the transmission line structures and conductors are visually subordinate from the campground due to vegetation screening, the existing ROW clearing is visible from many locations where understory vegetation has been thinned.

**KOP 9: Boundary of the Frank Church-River of No Return Wilderness Near Pistol Lake**

KOP 9 is located approximately 3 miles east of the Burntlog Route at its closest point (Figure 3.20-1). This KOP is located approximately 0.5 miles west of Pistol Lake on a ridgeline that forms the boundary of the FCRNRW in this area. This KOP represents what dispersed recreation users (hikers, horseback riders) might see from a location at the edge of the wilderness east of the new roadway segment for the Burntlog Route. It affords superior views across drainages and ridgelines, including a burned area of the BNF. SGP features would not be visible from Pistol Lake.

**KOP 10: Burnt Log Road (FR 447)**

KOP 10 represents foreground views from Burnt Log Road (FR 447) directed southwest (Figure 3.20-1). Burnt Log Road (FR 447) is currently a high-clearance vehicle route that provides access to Snowshoe Summit Trailhead at the edge of the FCRNRW and Burntlog Creek and ends near Chilcoot Pass. This road is a sensitivity level 2 travel route and has overall moderate visual sensitivity.

**KOP 11: FCRNRW Boundary**

KOP 11 is located at the Snowshoe/Summit trailhead on the western edge of the FCRNRW boundary. Due to topography and vegetation screening, it was determined that no SGP components would be visible from this location (Forest Service 2022n); therefore, it is not carried forward in the analysis.

**KOP 12: Mud Lake Dispersed Camping Area**

KOP 12 represents views from the Mud Lake dispersed camping area looking north-northwest (KOP 12a) and south-southeast (KOP 12b) (Figure 3.20-1). Burnt Log Road (FR 447) is currently a high-clearance vehicle travel route with moderate visual sensitivity that provides access to Mud Lake dispersed camping area, just 2 miles east of Landmark.

**KOP 13: Warm Lake Road (CR 10-579) at Landmark Maintenance Facility**

KOP 13 represents views looking north from the Warm Lake Road (CR 10-579) at the proposed Landmark Maintenance Facility location (Figure 3.20-1). Warm Lake Road (CR 10-579) is a paved, passenger vehicle accessible, travel route that provides access to Landmark and Warm Lake. This is a sensitivity level 1 travel route used by summer and winter recreational visitors.
**KOP 14: Cabin Creek Road (FR 467)**

KOP 14 represents views from Cabin Creek Road (FR 467) looking north-northeast (KOP 14a) and south-southwest (KOP 14b) toward the transmission line. Cabin Creek Road (FR 467) is north of the Warm Lake area, and cuts across the Thunderbolt Mountains, terminating at Johnson Creek Road (CR 10-413) near Trout Creek Campground. This travel route is a sensitive level 2 use area and is used frequently for OHV recreation. Recreational users have views of existing transmission line corridor vegetation clearing and pole structures.

**KOP 15: South Fork Salmon River Road (FR 474) and Warm Lake Road**

KOP 15 represents views from SFSR Road (FR 474) looking southwest (KOP 15a) and northeast (KOP 15b) toward the transmission line. SFSR Road (FR 474) is a sensitive level 1 travel route near the Warm Lake recreation area. This viewpoint represents views that travelers would see from the SFSR Road (FR 474) from Rice Creek coming into Warm Lake. The existing transmission line corridor is currently visible from this KOP; views of the existing switchgear are in the foreground, unobstructed. The existing conditions around the switchgear site appear to be previously disturbed, graded, and vegetation removed or thinned. This area has been historically altered by fires, and several dead and burned trees occupy the landscape, with isolated areas of mature trees and understory vegetation.

**KOP 16: Stibnite Gold Logistics Facility**

KOP 16 represents views from Warm Lake Road (CR 10-579) looking northeast (KOP 16a) and southwest (KOP 16b) toward the SGLF. Warm Lake Road (CR 10-579) is a paved, passenger vehicle-accessible travel route that provides access to Warm Lake. This is a high-sensitivity travel route that provides access to Warm Lake from Cascade. This area in Scott Valley is primarily undisturbed with few structures on the landscape.

**KOP 17: Lake Cascade Residence**

KOP 17 represents views of residents along SH 55 near Lake Cascade looking north toward the transmission line. Residential viewers near the transmission line in Cascade are limited to a few locations near Lake Cascade and along SH 55. Views are primarily unobstructed, because the transmission line corridor is immediately adjacent to these residences or visible in the foreground. Existing modifications in this rural setting are associated with neighboring residences, agricultural or ranching facilities, distribution lines, and local roads.

### 3.21 Social and Economic Conditions

#### 3.21.1 Introduction

This section includes a discussion of existing (baseline) social and economic conditions relevant to the SGP, including population and housing, income and labor, social conditions, public services, recreation use, and government revenues.
3.21.2 Social and Economic Conditions Resources Area of Analysis

The direct and indirect effects analysis area for social and economic conditions consists of Valley County and Adams County (and associated communities), which have the potential to be directly economically affected by the SGP (Figure 3.21-1). Valley County, which contains the entire SGP area, and the associated communities of Cascade, Donnelly, McCall, and the village of Yellow Pine, has the potential to be economically affected by the SGP. Adams County and the associated towns of New Meadows, Meadow Valley, Council, and Tamarack also are included in the analysis area because of their proximity to the SGP.

3.21.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to social and economic conditions. Additional descriptions of these regulations can be found in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o).

Land and Resource Management Plan: The Payette Forest Plan (Forest Service 2003a) and the Boise Forest Plan (Forest Service 2010a) regulate the use of NFS lands for the benefit of the nation. The Payette Forest Plan and the Boise Forest Plan both have several goals and objectives to provide direction on procedural approaches and outcomes for management of NFS social and economic resources and conditions. The goals do not prescribe any specific guidance applicable for assessing socioeconomic impacts, and the specific goals and objectives for social and economic conditions are described further in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o).

General Mining Act of 1872: The Mining Law (30 USC, Chapter 2) and subsequent amendments govern the right to locate, develop, and extract mineral deposits on federal lands open to mineral entry. The Forest Service regulates locatable mineral operations on the surface of the NFS lands under regulations codified at 36 CFR 228A.

Mining and Mineral Policy Act of 1970: Through the Mining and Mineral Policy Act of 1970, Congress has stated that it is the continuing policy of the federal government, in the national interest, to foster and encourage private enterprise in the development of economically sound and stable domestic mining, minerals, and metal and mineral reclamation industries; and the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help ensure satisfaction of industrial, security, and environmental needs. 30 U.S.C. 21a.

Forest Service Manual 1970 and Forest Service Handbook 1909.17: The FSM 1970 directs how economic and social analyses should be conducted to aid Forest Service decision making. Forest Service guidelines for socioeconomic analyses are outlined in FSH 1909.17, “Economic and Social Analysis Handbook”, which provides guidelines to be used to evaluate socioeconomic impacts that may result from policy, program, plan, or project decisions on NFS lands.

Valley County and Adams County Comprehensive Plans: Both the Valley County and Adams County comprehensive plans reaffirm the importance of natural resources to their communities’ economies (Adams County 2006; Valley County 2018a). The Valley County Comprehensive Plan includes goals and
objectives pertinent to the SGP to ensure mining remains a viable element in Valley County’s economy; to ensure new industrial activities consider long-term impacts and benefits on the local economy and environment; and, to maintain the role of the timber industry, tourism, outdoor recreation, mining, and agriculture in the local economy. Relevant goals under the Adams County Comprehensive Plan for the SGP include to provide an economically viable environment that builds and maintains a diverse base of business.

3.21.4 Affected Environment

The following section provides a summary of historic and current population and housing data, income and labor force trends, and government revenues based on the most recent data year available, as well as describes social conditions and public services in the analysis area. A complete discussion of social and economic conditions in the analysis area is provide in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o). Due to the uncertainties related to the ongoing changes in regional economic and social conditions, the data below may be inexact as it is based on prior economic conditions data and trends.

There is limited available information on use of the analysis area both by recreational visitors and Native American tribal members. As a result, the type, frequency, magnitude, and location of these users’ activities are largely unknown. Although adequate for the purposes of the socioeconomic impact analysis, limited fiscal information on Adams County’s government services and revenues was available. Neither Perpetua nor this socioeconomic analysis has been able to quantify direct revenue transfers to Valley and Adams counties resulting from the SGP’s expected future mineral license fee payments to the state of Idaho.

At the time of this reporting, some 2020 census data remains unavailable due to delays associated with the COVID-19 response; therefore, the analysis relies on the previously complete census datasets prior to 2020.

3.21.4.1 Population

Valley and Adams counties are both rural areas located in central Idaho with low population densities of 3.2 people per square mile for both counties (Census 2020). Valley County is Idaho’s fifth largest county by area (3,664 square miles) but is the 27th most populated (year-round) of the state’s 44 counties. Adams County is the 22nd largest county in Idaho by area (1,363 square miles) and one of the state’s least populated (year-round) counties (39th out of 44) (Census 2020). Valley County experiences an influx of seasonal residents, recreationists, and vacationers during both the summer and winter months which may not be accounted for in the available data (Valley County 2018a).

In 2020, Valley County had a total population of 11,746 with a median age of 49, and Adams County had a total population of 4,379 with a median age of 54. By comparison, Idaho’s corresponding total population was 1,839,106 with a median age of 36. Compared to the statewide population, both counties have a lower percentage of residents under 18 years old and a greater percentage of residents over 18 years old.
Figure 3-21-1 Census Tracts and Tribal Reservations in Relation to the Analysis Area
Stibnite Gold Project
Stibnite, ID

LEGEND

SGP Location

Other Features
- Tribal Reservation
- Adams County Census Block Group
- Valley County Census Block Group
- Census Tract
- County Boundaries/Analysis Area
- City/Town
- County
- State

Base Layer: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest; US Census Bureau

1 inch = 36 miles when printed at 11x17
Table 3.21-1 shows the populations of both counties and Idaho in 2010 and 2020. Age characteristics of both counties and Idaho in 2020 are provided in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o). Idaho was the second-fastest growing state, by population between 2010 and 2020.

The communities closest to the Operations Area Boundary include Council, New Meadows, McCall, Donnelly, Cascade, and Yellow Pine. The largest of these communities are McCall (2019 population: 3,347) and Council (2019 population: 747). Cascade had a population of 745, and New Meadows had a population of 430 in 2019 (Census 2019). Yellow Pine and Donnelly are very small communities with only 246 and 72 residents in 2019, respectively (Census 2019). Altogether, approximately half of Valley and Adams counties’ total year-round populations reside in these six communities.

### Table 3.21-1 Valley County, Adams County, and Idaho Population Demographics

<table>
<thead>
<tr>
<th>Year</th>
<th>Valley County</th>
<th>Adams County</th>
<th>Idaho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2020)</td>
<td>11,746</td>
<td>4,379</td>
<td>1,839,106</td>
</tr>
<tr>
<td>Population (2010)</td>
<td>9,854</td>
<td>3,978</td>
<td>1,567,657</td>
</tr>
<tr>
<td>Percent of Population Increase (2010 to 2020)</td>
<td>19.2%</td>
<td>10.1%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>

Source: Census 2010, 2020

#### 3.21.4.2 Housing

During the 1990s and early 2000s, Valley County experienced considerable growth in new housing units. However, since the 2008 recession, new housing construction has been relatively limited. In 2010, Valley County had an estimated total of 11,789 housing units, which increased by only 439 additional housing units by 2018 (3.7 percent increase). Similarly, from 2010 to 2018, Adams County added only 47 additional housing units (1.8 percent increase) (Census 2010, 2020).

The majority of Valley County’s housing inventory consists of vacation/seasonal second homes for out-of-county residents (Census 2010, 2018). Of Valley County’s 12,228 housing units in 2018, nearly 72 percent (8,767 units) were occasionally vacant. A total of 8,423 vacant units were reported for seasonal, recreational, or occasional use (i.e., generally second homes) with 225 non-seasonal vacant units for sale, rent, or otherwise vacant (Census 2018). Adams County reports a much lower vacancy rate of 38 percent; however, like Valley County, most vacant units are reported for seasonal, recreational, or occasional use (897 units), with 96 units available for sale, rent, or otherwise vacant.

Residential communities within the analysis area are well-established and stable. Most residents own their homes, with approximately 26 percent and 33 percent having lived in their current place of residence for 20 years or more in Valley and Adams counties, respectively (Census 2018).

The data suggest much of the housing formerly available to permanent residents has been sold to second home buyers, increasing the number of occasional housing units and decreasing the availability of housing to local residents (Highland Economics 2018). Census data on housing prices in Valley and Adams counties do not show an increase in sale price resulting from a relatively low availability of housing, as median owner-occupied housing prices for both counties have fluctuated but generally not
risen since 2010 (Census 2010, 2018; Highland Economics 2018), as shown in Table 3.21-2. Conversely, median rental rates increased in Valley County by 4.5 percent ($727 in 2010 to $760 in 2018) and in Adams County by 22.8 percent ($504 in 2010 to $619 in 2018; Census 2010, 2018b). Between 2010 and 2018, the percentage of Valley County households paying more than 30 percent of their household income on rent grew from 33.5 percent to 59.1 percent (Census 2010, 2018b). This increase indicates that the local rental market is becoming less affordable. However, the percentage of households paying more than 30 percent of their household income on rent decreased from approximately 50 percent to 39.9 percent in Adams County indicating that its local rental market has become slightly more affordable (Census 2010, 2018b).

Table 3.21-2 Valley County, Adams County, and Idaho Years of Living in the Same House (2018)

<table>
<thead>
<tr>
<th>Housing Data</th>
<th>Valley County</th>
<th>Adams County</th>
<th>Idaho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median value of owner-occupied housing units (2010)</td>
<td>$287,100</td>
<td>$205,100</td>
<td>$172,700</td>
</tr>
<tr>
<td>Median value of owner-occupied housing units (2018)</td>
<td>$283,000</td>
<td>$173,100</td>
<td>$192,300</td>
</tr>
<tr>
<td>Percent change of median value of owner-occupied housing units</td>
<td>-1.4%</td>
<td>-15.1%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Median rental rates of renter-occupied housing units (2010)</td>
<td>$727</td>
<td>$504</td>
<td>$689</td>
</tr>
<tr>
<td>Median rental rates of renter-occupied housing units (2018)</td>
<td>$760</td>
<td>$619</td>
<td>$825</td>
</tr>
<tr>
<td>Percent change of median rental rates of renter-occupied housing units</td>
<td>4.5%</td>
<td>22.8%</td>
<td>19.7%</td>
</tr>
</tbody>
</table>

Source: Census 2010, 2018

3.21.4.3 Income and Labor

Valley County’s economy is relatively strong, and median household and per capita incomes in Valley County were slightly higher than the statewide averages, as shown in Table 3.21-3. The percentage of people not in the labor force in Valley County was also higher than the statewide average. Adams County has a comparatively weaker economy than neighboring Valley County, and median household and per capita incomes were lower than the statewide average, while its unemployment rate was nearly twice the statewide rate (Table 3.21-3).

The Idaho Department of Labor collects data on current employment by industry in each county and projects employment growth by economic region over a 10-year period (2016-2026). Both Valley and Adams counties are identified by the Idaho Department of Labor as part of the Southwestern Region, and future employment growth in the region’s professional and business services (e.g., trade, utilities, and transportation), as well as educational and health services sectors, are expected to substantially increase by 2026. No employment growth from other new major mine operations in the region’s mining and manufacturing sector over the 10-year period was forecasted (Idaho Department of Labor 2019).
Table 3.21-3  Valley County, Adams County, and Idaho Income and Employment

<table>
<thead>
<tr>
<th>Income Parameter</th>
<th>Valley County</th>
<th>Adams County</th>
<th>Idaho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Capita Income (2018)</td>
<td>$30,838</td>
<td>$25,143</td>
<td>$26,772</td>
</tr>
<tr>
<td>Percentage of People Below Poverty Level (2018)</td>
<td>10.0%</td>
<td>11.4%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Percentage of Population 16 Years and Over – Not in</td>
<td>50.5%</td>
<td>49.6%</td>
<td>37.6%</td>
</tr>
<tr>
<td>Labor Force (2018)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Population 16 Years and Over –</td>
<td>4.2%</td>
<td>6.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Unemployed (2019)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Census 2018; Idaho Department of Labor 2020c, 2021

1 The U.S. Census Bureau (Census) American Community Survey provides the most recent 2018 data for the population not in the labor force. The Idaho Department of Labor provides total unemployment for 2019; however, the Department does not provide data for the percentage of the population not in the labor force.

Valley County was greatly affected by the 2008 recession, but in recent years its economy has subsequently recovered. Historically, Valley County’s economy was dependent on timber extraction, but the county’s last major mill closed in 2001, and the resulting loss of 70 jobs has continued to impact the area (IDEQ 2019d). Today, tourism is a primary driver of the Valley County economy. Currently, Valley County’s highest paying jobs are in mining followed by information services, government, and education/health service sectors, while the lowest paying jobs include leisure and hospitality and other services (Idaho Department of Labor 2020b).

Adams County’s economy has recovered more slowly since the 2008 recession but has benefited from an increase in retirees relocating to the area. In 2018 the government sector jobs accounted for the largest share (31 percent) of Adams County employment. Unlike Valley County, Adams County remains more dependent on natural resources, including farming, ranching, and the timber industry (Idaho Department of Labor 2020b, 2020c). There are currently no active metal mines operating in Adams County (Idaho Department of Labor 2020c). The information sector provides Adams County’s highest paying jobs, while the tourism-industry (i.e., leisure and hospitality sector) has the lowest paying jobs (Idaho Department of Labor 2020c).

Over three quarters of Valley County workers commute less than 20 minutes to work. Adams County residents generally have much longer average commutes than Valley County or the state, with approximately 18 percent of Adams County workers commuting more than 45 minutes to work (nearly twice the statewide rate).

The Forest Service supports local economies within the analysis area through recreation, timber, energy, minerals, and livestock grazing, and counties with national forests receive funds to support schools, road maintenance, and stewardship projects. The Forest Service also contributes through its construction and maintenance of infrastructure, environmental restoration, and forest health management activities.

In 2016, Forest Service’s management and stewardship activities for the PNF supported approximately 2,010 local jobs and $73.2 million in local labor income (Forest Service 2016e). The agency’s activities...
for the BNF supported approximately 2,580 local jobs and $113.0 million in local labor income in 2016 (Forest Service 2016f).

### 3.21.4.4 Social Conditions

The central Idaho region provides residents and visitors a natural and rural setting with a remote character, outdoor recreation opportunities, natural beauty, and scenic quality of public lands valued by many area residents. In addition, many of these central Idaho communities have mixed cash-subsistence economies, providing both wage-based employment and subsistence lifestyle opportunities, which contribute to residents’ quality of life and “sense of place” – an unquantifiable value attracting people to specific locations, generates a community identity, and contributes to the overall quality of life (Williams 2014). Some of the cultural attributes of this traditional value structure include appreciation of open space and rural living, access to undeveloped and scenic land for recreational uses (e.g., hunting and fishing), and maintenance of traditional rural and public lands as well as natural landscapes (AECOM 2018).

Valley County has a history of mining dating back over 100 years since the Thunder Mountain gold rush in the early 1900s. See the SGP Heritage Resources Specialist Report (Forest Service 2022l) for a detailed discussion of the Stibnite-Yellow Pine Mining District history.

Both Valley and Adams counties include large areas of federally administered lands and surrounding areas of private lands, which are prized for their remoteness and natural beauty. In recent years, both counties have attracted new residents including recreationists and retirees looking for small towns, natural beauty, and wide-open areas and landscapes.

### 3.21.4.5 Native American Tribes

Traditional Native American land use occurs throughout the analysis area. The regional tribes include the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes. The socioeconomic conditions of each of these tribes are discussed below. Figure 3.21-1 shows the location of these tribe’s primary communities in relation to the analysis area; however, significant populations of tribal members also live outside those communities elsewhere within the region that also could be affected by the SGP.

**Nez Perce Tribe**

The Nez Perce Reservation encompasses portions of Nez Perce, Clearwater, Lewis, and Idaho counties in Idaho. Nez Perce Census County Division (CCD) is a Census recognized subdivision within the Reservation that includes the community of Lapwai, which is the seat of the Nez Perce Tribal government and has the highest proportion of tribal members as residents (Figure 3.21-1). The Tribal headquarters, school, and casino also are located in the Nez Perce CCD. The Nez Perce CCD was selected to represent the population of the Nez Perce Tribe for the social and economic conditions analysis. The Nez Perce Tribe’s largest economic sector is educational and health care services, which employs 25 percent of the local workforce (Census 2018). Public administration employs 13 percent of the local workforce, while its natural resources sector (e.g., agriculture, forestry, fishing, hunting, and mining) and recreation and service sector (e.g., arts, entertainment, recreation, accommodation, and food services) each provide around 11 percent and 8 percent of residents’ jobs, respectively (Census 2018). Important tribal
enterprises include its fisheries restoration program, fish hatchery operations, and casino. Other tribal enterprises include a convenience store, recreational vehicle park, and forestry products company (Nez Perce Tribe 2018b).

**Shoshone-Bannock Tribes of the Fort Hall Reservation**

The Fort Hall Reservation is in southeast Idaho (Figure 3.21-1). Fort Hall Reservation’s largest source of employment is the recreation and service sector (e.g., arts, entertainment, recreation, accommodation, and food services), which employs 21 percent of the local workforce (Census 2018). The reservation’s education, health care, and public administration sectors provide jobs for another 16 percent of the local workforce (Census 2018). The Tribe also operates a casino, hotel, wildlife and fisheries restoration programs, and the Famous Potatoes farming businesses.

**Shoshone-Paiute Tribes of the Duck Valley Reservation**

The Duck Valley Reservation is located in southern Idaho/northern Nevada (Figure 3.21-1). The Duck Valley Reservation’s largest economic sectors are public administration, which employs 41 percent of the local workforce, and educational and health care services, which provides jobs for another 32 percent of the workforce (Census 2018). The Tribe manages three trout fisheries, several camping areas, a solid waste transfer station, and a recycling center.

3.21.4.6 **Public Services**

Valley and Adams counties, along with their municipalities, provide police, fire, utilities, schools, and libraries for residents and workers. Because new residents relocating to the region for work at the SGP could result in population growth that would generate greater demand for public services in the local area, the following sections focus on the communities within the analysis area where any SGP-related population growth would likely occur.

**Police**

Police services are provided by the Valley County Sheriff’s Department, the Adams County Sheriff’s Department, the Idaho State Police, and the McCall City Police. The Valley County Sheriff’s Department patrols the unincorporated portions of Valley County in the analysis area and the communities of Donnelly and Cascade. The Adams County Sheriff’s Department provides police services for New Meadows and Council. McCall has its own local police department, which cooperates with the Valley County Sheriff’s Department, the Idaho State Police, and other agencies including the Forest Service and the Idaho Department of Fish and Game. Reported crime in Valley County decreased slightly between 2014 (283 reported incidents) and 2018 (279 reported incidents), which represented a decrease in crime by 1.4 percent over the five-year period (Idaho State Police 2018). During that same period, reported crime in Adams County increased from 113 to 232 reported incidents, which represented a 51 percent increase over the five-year period (Idaho State Police 2018). In both counties, most of these offenses consisted of drug/narcotic violations (Idaho State Police 2018).

Forest Service Uniformed Law Enforcement Officers and Forest Protection Officers provide year-round enforcement of federal laws governing the National Forests. In addition, the Forest Service contracts with
the Valley County Sheriff’s Department to patrol National Forest areas from May through September. The BOR also contracts Valley County to patrol their lands, campgrounds, and waterways over the same summer period.

**Fire Protection**

There are four major structural fire-fighting agencies and districts in Valley County serving the communities of Cascade, Donnelly, McCall, and Yellow Pine, and their surrounding rural areas. There also are two small fire-fighting agencies in Adams County that serve New Meadows and Council. These fire-fighting agencies provide 24-hour fire protection for businesses and residents in their service areas and are mostly staffed by volunteers. All the fire-fighting districts within Valley County, the PNF, and the BNF comprise the Valley County Fire Working Group Collaborative (Wildfire Prevention Associates 2018). This group is responsible for the continued update of the Valley County Wildfire Protection Plan and emphasizes prevention of wildland-urban interface fires using a proactive, cooperative approach; ensures that the land development ordinances and building codes in Valley County support mitigation of wildland-urban interface fire danger; and promotes effective fuel reduction programs in all wildland-urban interface areas in Valley County (Wildfire Prevention Associates 2018).

**Utilities**

The communities of Cascade, Donnelly, McCall, and Yellow Pine in Valley County each operate their own community water and sewer systems. In addition, there are several condominium complexes, subdivisions, and church camps with central water systems and a few subdivisions that have central sewer systems. Some outlying areas have formed districts (such as the Northlake Recreational Sewer and Water District), but most of Valley County’s rural homes rely on individual water wells and septic systems. Both Adams County and New Meadows operate their own water and sewer systems. Both Adams and Valley counties contract with Lakeshore Disposal for trash hauling services and operation of two materials recovery facilities located in New Meadows and Donnelly. These facilities serve as transfer stations, and the collected solid waste is hauled for processing and disposal at recycling centers and landfills outside the county. Residents can haul their own refuse to the materials recovery facilities for a nominal dumping and processing fee. Residents also can drop off recyclables in New Meadows, Council, McCall, Cascade, and Donnelly.

Utilities and communications are readily available to Valley and Adams counties residents. Idaho Power Company provides electric service to the region. Natural gas is not available in the area; therefore, homes are heated with electricity, propane, fuel oil, wood, and/or pellets.

**Education**

Valley County has a slightly higher percentage of individuals with a high school degree or higher (94 percent) than the state average of 90 percent. Approximately 32 percent of Valley County residents have a bachelor’s degree or higher (Census 2018). Valley County has two public school systems, McCall/Donnelly School District No. 421 (which includes the village of Yellow Pine) and Cascade School District No. 422.
McCall/Donnelly School District No. 421 serves the northern part of Valley County and includes five schools as shown with enrollment in Table 3.21-4.

Table 3.21-4 Enrollment for McCall/Donnelly School District No. 421

<table>
<thead>
<tr>
<th>School Name</th>
<th>2000 Enrollment</th>
<th>2010 Enrollment</th>
<th>2019 Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donnelly Elementary</td>
<td>106</td>
<td>121</td>
<td>166</td>
</tr>
<tr>
<td>Barbara R. Morgan Elementary</td>
<td>301</td>
<td>299</td>
<td>413</td>
</tr>
<tr>
<td>Payette Lakes Middle School</td>
<td>235</td>
<td>218</td>
<td>314</td>
</tr>
<tr>
<td>McCall/Donnelly High School</td>
<td>359</td>
<td>275</td>
<td>338</td>
</tr>
<tr>
<td>Heartland High School</td>
<td>22</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td><strong>District Total</strong></td>
<td><strong>1,023</strong></td>
<td><strong>930</strong></td>
<td><strong>1,265</strong></td>
</tr>
</tbody>
</table>

Source: Idaho Department of Education 2019; Midas Gold 2017h

Cascade School District No. 422 provides kindergarten through high school education for southern Valley County residents at its single facility, the Cascade School. In 2000, the Cascade School’s enrollment was 310 students, which fell to 293 students in 2010 and to 192 students in 2019 (Idaho Department of Education 2020a).

Several private and public schools in Valley County also provide other education options, including two private schools located in McCall, North Fork School and Crestline Academy. North Fork School, which had approximately 19 students during the 2019-2020 school year, provides third through 12th grade education and most North Fork School students are dually enrolled in the McCall-Donnelly public schools (North Fork School 2020). Crestline Academy provides kindergarten through 12th grade education. The University of Idaho Cooperative Extension Office, located in Cascade, administers the local 4-H program, which provides continuing education for adults.

The Western Idaho Community Action Partnership, Inc., a private non-profit organization, administers the Head Start Program in Donnelly. The program provides early childhood education programs for three- and four-year-old children from low-income households, and for disabled children.

Adams County has a slightly lower percentage of individuals with a high school degree or higher (89 percent), which is comparable to the state average of 90 percent (Census 2018). Adams County has public schools in New Meadows and Council. Meadows Valley School provides pre-kindergarten through high school education with a 2019 enrollment of 153 students (Idaho Department of Education 2020b). The Council Elementary School provides pre-kindergarten through sixth grade education with a 2019 enrollment of 148 students (Idaho Department of Education 2020c). The Council Junior-Senior High School provides seventh grade through 12th grade education and enrolled 111 students in 2019 (Idaho Department of Education 2020c). Between 2010 and 2019, Meadows Valley School District’s student enrollment decreased by 22 percent, while enrollment in the Council School District increased by 14 percent (Idaho Department of Education 2020b, 2020c).
**Libraries**

Valley County has three public libraries located in McCall, Donnelly, and Cascade. The Donnelly Library is funded through the Donnelly Public Library District, while the McCall and Cascade libraries are funded by city taxes. Adams County has libraries in New Meadows and Council that are funded by city taxes, but residents outside the city limits can pay membership dues to obtain library service privileges. In addition to their lending services, the libraries provide public access to internet, fax and copy services, medical journals, legal materials, videos, audio books, periodicals, inter-library loan services, backcountry services, outreach programs, reading programs, and research assistance. There also is a law library at the Valley County Courthouse in Cascade, which is open to the public.

**3.21.4.7 Recreation Use**

Recreation users in the analysis area are mostly locals, originating from areas such as Yellow Pine, Warm Lake, Big Creek/Edwardsburg, Cascade, and Long Valley (Forest Service 2010a). Users particularly in the western portion of the analysis area are from populated areas further south including Treasure Valley and Boise (Forest Service 2010a). Recreation use occurs throughout NFS, state, and private lands in the analysis area. Recreation is described further in Section 4.19 and in the SGP Recreation Specialist Report (Forest Service 2022m). In 2019, there were a variety of recreation-related special use permits issued by the Forest Service within the analysis area: three lodges, one bicycle event, four outfitters and guides, two organizational camps, and 62 recreation residences. Permits issued for the PNF include a lodge, biking event, and three outfitters and guides while permits issued for the BNF include one outfitter and guide, two lodges, two organizational camps, and 62 recreation residences. All but one of the recreation-related special use permits issued for the BNF are in the Warm Lake area.

**3.21.4.8 Government Revenues**

Valley and Adams counties residents and businesses pay federal, state, and local income taxes. Household and business purchases generate sales taxes, and the structures owned by individuals and businesses in the area are subject to city and/or county property taxes. There also are product taxes and/or fees on many items, including beer, wine, cigarettes, motor fuels, motor vehicle licensing fees, regulatory taxes, and business ownership. Idaho tax revenues for Fiscal Years 2017 and 2019 are provided in Table 3.21-5.

<table>
<thead>
<tr>
<th>Table 3.21-5 Idaho Tax Revenues for Fiscal Years 2017 and 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Taxation</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Personal Income/Property</td>
</tr>
<tr>
<td>Corporate Income/Property</td>
</tr>
<tr>
<td>State Sales</td>
</tr>
<tr>
<td>Product</td>
</tr>
<tr>
<td>Mine License Fees</td>
</tr>
<tr>
<td>Other Miscellaneous</td>
</tr>
<tr>
<td>Total Revenues</td>
</tr>
</tbody>
</table>

Source: Idaho Division of Fiscal Management 2020; Midas Gold 2017h. M = million.
Revenues for funding county services are obtained from a variety of sources, including local sales and use taxes, local property taxes, Idaho general funds, Idaho Lottery funds, and Idaho highway users’ funds. Schools in Valley and Adams counties also receive federal funding under the Secure Rural Schools program.

Valley County had a 2018 budget of $25.1 million, which included $7.5 million in property taxes, $3.8 million in intergovernmental revenues, and $1.5 million in grants funding (Valley County 2018b) among other sources. Adams County had a 2018 budget of $8.9 million, which included $2.4 million in taxes, $0.3 million in grants, and $2.2 million in state funding (Adams County 2018) among other sources. Neither Valley County nor Adams County has a separate sales tax; however, the cities of Donnelly and McCall impose a one percent local sales tax in addition to Idaho’s six percent state sales tax. Both counties collect property taxes from lands and structures owned by individuals and businesses. These collected property taxes fund county government operations and local school systems.

Both counties have a high percentage of federal lands, which limits their potential tax base. In 2017, Valley County received approximately $2.6 million in federal land payments for the 2,046,000 acres (or 88 percent) of federally managed Valley County land (Midas Gold 2017h). The federal land payments consisted of approximately $1.8 million in Forest Service Revenue Sharing and $0.8 million Payment In Lieu of Taxes disbursements. Approximately $2.0 million of these federal land payments were distributed to the County government and comprised eight percent of the Valley County budget (Headwaters Economics 2019a; Valley County 2018b). Local school districts received approximately $500,000 of these federal land payments with the remainder distributed to the region’s Resource Advisory Committee.

Federally managed land accounts for approximately 68 percent of Adams County’s land base. In 2017, Adams County received approximately $900,000 in federal land payments consisting of approximately $700,000 in Forest Service Revenue Sharing and $200,000 in Payment In Lieu of Taxes disbursements. Approximately $700,000 in federal land payments were distributed to the county government and $200,000 million was distributed to local school districts. Federal land payments comprised 7 percent of the Adams County budget (Adams County 2018; Headwaters Economics 2019b).

Mining and mineral sales in Idaho result in property taxes and mining licensing fees for both the state and counties, and mineral extraction from public lands also can generate lease and royalty payments for the government. In 2012, the State of Idaho and its local governments received mine operations contributions of approximately $6.0 million in local property taxes and $7.0 million in state royalties, rents, and license fees (Idaho Mining Association 2013).

### 3.22 Environmental Justice

#### 3.22.1 Introduction

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice is considered during the NEPA process to determine whether any disproportionately high and adverse human health or environmental
effects to low-income, racial minority, and tribal populations may occur as a result of the federal action, in accordance with EO 12898.

**3.22.2 Environmental Justice Area of Analysis**

The analysis area for environmental justice consists of the communities and populations that would potentially be adversely affected (either directly or indirectly) by the SGP. The communities identified with the potential to be affected by the SGP comprise all of Valley County and Adams County and are represented by the 2017 Census tracts shown on Figure 3.22-1. In addition, the environmental justice analysis area includes Native American Tribes whose traditional subsistence range includes the SGP area (i.e., the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes) to determine the extent that tribal members would experience adverse health or environmental effects as a result of the SGP. These communities are located more than 100 miles from the analysis area. However, tribal members may have long-established cultural, ceremonial, and subsistence use relationships with the wilderness areas in and around the analysis area and surrounding public lands. The Nez Perce CCD is a census-recognized subdivision within the Reservation that includes the community of Lapwai, which is the seat of the Nez Perce tribal government and has the highest proportion of tribal members as residents. Therefore, the Nez Perce CCD was selected to represent the population of the Nez Perce Tribe for the environmental justice analysis.

**3.22.3 Relevant Laws, Regulations, Policies, and Plans**

Several laws and implementing regulations apply to the Proposed Action and action alternative. The following is a list of additional laws, regulations, policies, and plans at the federal, state, or local level pertaining to Environmental Justice.

Executive Order 12898 - Requires federal agencies to “identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations” (Executive Office of the President 1994).

Executive Order 13985 – Sets expectation for a whole government approach for federal agencies. Section 8 directs federal agencies to: (1) consult with members of communities historically underrepresented in the Federal Government and underserved by, or subject to discrimination in, Federal policies and programs; and (2) evaluate opportunities, consistent with applicable law, to increase coordination, communication, and engagement with community-based organizations and civil rights organizations. (Executive Office of the President 2021a).

Executive Order 14008 – Requires agencies to make achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related, and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts. (Executive Office of the President 2021).
National Forest Land and Resource Management Plans - The Payette Forest Plan (Forest Service 2003a), and the Boise Forest Plan (Forest Service 2010a) provide management prescriptions designed to realize goals for achieving desired condition for environmental justice and include various objectives, guidelines, and standards for this purpose.

NEPA Guidance for Forest Service implementation of NEPA (2014) utilizes the CEQ definition of minority populations:

1. A readily identifiable group of people living in geographic proximity with a population that is 50 percent minority. The population with a 50 percent minority may be made up of one minority or a number of different minority groups; together the sum is 50 percent.

2. A minority population may be an identifiable group that has a meaningfully greater minority population than the adjacent geographic areas or may also be a geographically dispersed/transient set of individuals such as migrant workers or Native Americans.

While both definitions were examined, the second definition was more applicable for the SGP.

For a community to meet the federal definition of an environmental justice community for its low-income status, the percentage of people with an income below the Federal Poverty Level in the Census block group, CCD, or reservation for this analysis would need to be meaningfully greater than the statewide average.

**3.22.4 Affected Environment**

The state of Idaho was used to represent the general population and “meaningfully greater” was defined as 5 percentage points or more per Forest Service guidance to identify minority communities of concern for environmental justice analysis (Forest Service 2014d). Given the total minority population statewide of 17.4 percent, a community with a total minority population of 22.4 percent or more would meet the definition of a minority community.

Many of the local communities have mixed cash-subsistence economies that provide wage-based employment opportunities, as well as opportunities for a subsistence lifestyle that also contribute to residents’ quality of life and sense of place. As a result, there could be SGP-related cultural and/or socioeconomic impacts on the tribal populations that have traditional hunting, gathering, and fishing rights to lands at or near SGP-related components. The Native American populations included in the analysis live throughout Idaho, Washington, Oregon, and Nevada. The Nez Perce Reservation’s major tribal population lives in the towns of Lapwai and Kamiah, Idaho which are part of the Nez Perce CCD. The Nez Perce CCD is recognized as a community that could potentially experience SGP-related socioeconomic impacts. The Shoshone-Bannock Tribes on the Fort Hall Reservation and Shoshone-Paiute Tribes on the Duck Valley Indian Reservation are other Native American communities that could potentially experience SGP-related socioeconomic impacts.
3.22.4.1 Environmental Justice Communities in the Analysis Area

Table 3.22-1 shows the race, ethnicity, and poverty percentages for each community (by Census block group, CCD, or reservation) in the environmental justice analysis area. The table also shows the corresponding demographics for Idaho’s statewide population, which is applied as the general reference population for evaluating whether a community has a meaningfully greater minority population or community with environmental justice concerns.

Valley County and Adams County

In Valley and Adams counties, no community in the analysis area met the definition of an environmental justice community. Because of its proximity to the proposed SGP and its smaller population, the community of Yellow Pine was reviewed to determine its environmental justice status. Yellow Pine is in Block Group 2 of Census Tract 9701. However, in 2017 the population of this block group was 100 percent white, and only 7.0 percent of its residents had incomes below the federal poverty line, which is less than half of the statewide average (14.5 percent) (Census 2017). As a result, the community of Yellow Pine does not meet the definition of an environmental justice community.

3.22.4.2 Nez Perce Tribe

The Nez Perce Reservation is a geographically large area with a diverse population of 18,790 residents (Census 2017). Historically, the Nez Perce Tribe was a nomadic tribe whose territory included what is now Idaho, Oregon, Washington, and Montana. Today, the Nez Perce Reservation encompasses portions of Nez Perce, Clearwater, Lewis, and Idaho counties in Idaho.

The Nez Perce CCD, which is a Census recognized subdivision within the Nez Perce Reservation, is located entirely within Idaho (Figure 3.22-1) The majority (66 percent) of the subdivision’s 2,670 residents that self-identify as Native American. The Nez Perce CCD meets the definition of an environmental justice minority community based on its American Indian population (35.2 percent) and total minority population (48.4 percent), which are both meaningfully greater than Idaho’s statewide averages (1.1 percent American Indian and 17.4 percent total minority). The Nez Perce Tribe also meets the definition of a community with environmental justice concerns, because the percentage of its residents with annual incomes below the federal poverty level (19.8 percent) is meaningfully greater than Idaho’s statewide average (14.5 percent).

3.22.4.3 Shoshone-Bannock Tribes of the Fort Hall Reservation

The Shoshone-Bannock Tribes of the Fort Hall Reservation historically occupied vast regions of what is now Idaho, Oregon, Nevada, Utah, Wyoming, Montana, and areas of Canada (ICCNAC 1992). The Fort Hall Reservation is located in southeast Idaho (Figure 3.21-1).
<table>
<thead>
<tr>
<th>Geography</th>
<th>White Alone(^1)</th>
<th>Hispanic(^2) Origin</th>
<th>African American</th>
<th>American Indian and Alaska Native</th>
<th>Asian</th>
<th>All Other Minorities(^3)</th>
<th>Total Minority(^4)</th>
<th>Below Federal Poverty Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Idaho</td>
<td>82.0%</td>
<td>12.5%</td>
<td>0.7%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>2.2%</td>
<td>18.0%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Census Tract 9701, Valley County, Idaho</td>
<td>95.8%</td>
<td>3.4%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.7%</td>
<td>4.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Census Tract 9702, Valley County, Idaho</td>
<td>98.4%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.6%</td>
<td>0.8%</td>
<td>0.0%</td>
<td>1.6%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Census Tract 9703, Valley County, Idaho</td>
<td>91.4%</td>
<td>8.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>8.6%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Census Tract 9501, Adams County, Idaho</td>
<td>90.7%</td>
<td>5.3%</td>
<td>0.0%</td>
<td>2.7%</td>
<td>0.0%</td>
<td>1.3%</td>
<td>9.3%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Census Tract 9502, Adams County, Idaho</td>
<td>93.0%</td>
<td>2.4%</td>
<td>0.7%</td>
<td>1.1%</td>
<td>0.0%</td>
<td>2.4%</td>
<td>7.0%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Nez Perce CCD(^5), Nez Perce County, Idaho</td>
<td>51.6%</td>
<td>6.2%</td>
<td>0.5%</td>
<td>(35.2)%</td>
<td>0.4%</td>
<td>6.1%</td>
<td>(48.4)%</td>
<td>(19.8)%</td>
</tr>
<tr>
<td>Duck Valley Reservation(^6)</td>
<td>6.8%</td>
<td>5.1%</td>
<td>0.2%</td>
<td>(83.9)%</td>
<td>0.9%</td>
<td>3.1%</td>
<td>(93.2)%</td>
<td>(32.3)%</td>
</tr>
<tr>
<td>Fort Hall Reservation(^6)</td>
<td>26.6%</td>
<td>11.9%</td>
<td>0.0%</td>
<td>(58.4)%</td>
<td>1.0%</td>
<td>2.0%</td>
<td>(73.4)%</td>
<td>(21.9)%</td>
</tr>
</tbody>
</table>

Source: Census 2017 (most recent data for Nez Perce CCD, Duck Valley Reservation, Fort Hall Reservation), Census 2019 (State of Idaho, Valley County, Adams County)

\(^1\) Non-Hispanic White population only, as a basis of comparison for minority groups.

\(^2\) Hispanic is an ethnicity which could include any race, including White.

\(^3\) All Other Minorities includes Native Hawaiian and Other Pacific Islander, some other race, and two or more races.

\(^4\) Total minority equals total population minus the Non-Hispanic White population.

\(^5\) CCD = Census County Subdivision – A county subdivision delineated cooperatively by the Census and local government authorities.

\(^6\) Census identified American Indian Reservation areas and populations.

**Bold** indicates block group or CCD meets the definition of an environmental justice community.
The Fort Hall Reservation includes a population of 5,955 residents, of which approximately 58 percent self-identify as Native American (Census 2017). The Fort Hall Reservation meets the definition of an environmental justice minority community, as its American Indian population (58.4 percent) and total minority population (73.4 percent) are both meaningfully greater than Idaho’s statewide averages (1.1 percent American Indian and 17.4 percent total minority). The Fort Hall Reservation also meets the definition of a community with environmental justice concerns, because the percentage of its residents with annual incomes below the federal poverty level (21.9 percent) is meaningfully greater than Idaho’s statewide average (14.5 percent).

3.22.4.4 Shoshone-Paiute Tribes of the Duck Valley Indian Reservation

The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, located in southwestern Idaho and northeastern Nevada (Figure 3.21-2), historically occupied what is now Idaho, Nevada, and Oregon.

The Duck Valley Reservation includes a population of 1,353 residents (Census 2017). Of these residents, approximately 84 percent self-identify as Native American. The Duck Valley Reservation meets the definition of an environmental justice minority community based on its American Indian population (83.9 percent) and total minority population (93.2 percent) as both are meaningfully greater than Idaho’s statewide averages (1.1 percent American Indian and 17.4 percent total minority). The Duck Valley Reservation also meets the definition of a community with environmental justice concerns, because the percentage of its residents with annual incomes below the federal poverty level (32.3 percent) is meaningfully greater than Idaho’s statewide average (14.5 percent).

3.22.4.5 Native American Use of SGP Area

Numerous areas throughout the PNF and the BNF have traditional, cultural, and spiritual significance for the tribes. Tribal use, preservation, and protection of these sacred areas are important means by which tribal members maintain their cultural and religious links to the past and their ancestors. Areas with more than one type of cultural significance to the tribes often include locations such as mountain ridges, hot springs, waterfalls, trails, rock art panels, and traditional collection areas. Other landscape features of importance include Riordan Lake and high points in the landscape (e.g., mountain tops and ridgelines), which have religious significance and traditional plant gathering locations or collection areas.

The Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes traditional subsistence ranges include the SGP area. There are several traditionally collected plant and animal species, including various types of salmon, in the analysis area. These resources continue to be important to the tribes with interests in the area. Information received from the tribal ethnographies indicate that areas, resources, and off-reservation rights of concern and importance include fishing rights in the SFSR watershed, including the East Fork SFSR, Meadow Creek, Fiddle Creek, West End Creek, and Sugar Creek.

The gathering of traditional plants and animals continues to be a significant part of the individual cultures of the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes. The ethnographies identify specific fish, wildlife, and plants that are of traditional and continued cultural importance. The Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes see this hunting and gathering practice as an important link to their past. Furthermore, due to their concern with maintaining this aspect
of their cultures, the Tribes are taking an increasingly active role in the protection and restoration of various species of plants, animals, and fish.

The analysis for considering impacts on environmental justice communities is described in **Section 4.22**.

### 3.23 Special Designations

#### 3.23.1 Introduction

This section describes the existing (baseline) conditions relevant to special designations that have the potential to be affected by the SGP.

#### 3.23.2 Special Designations Resources Area of Analysis

The analysis area for wilderness consists of the FCRNRW in the PNF MA 14, BNF MA 22, and a portion of the Salmon-Challis National Forest with Big Creek as the northern boundary and the Middle Fork Salmon River as the eastern and southern boundary. The analysis area also includes recommended wilderness within PNF MA 12 SFSR and BNF MAs 18 Cascade Reservoir and 19 Warm Lake (**Figure 3.23-1**).

The analysis area for WSRs includes the study corridors for those rivers determined to be eligible and suitable for inclusion in the National System that intersect with the SGP area and the management areas associated with these waterways. Study corridors extend 0.25 mile on either side from the high-water mark of each eligible or suitable river segment. **Figure 3.23-2** shows the location of study corridors, which are the analysis area, in relation to SGP components. Specific river segments that are crossed by SGP components and are the focus of this analysis include: Burntlog Creek (eligible), Johnson Creek (eligible), and SFSR (suitable) (Forest Service 2003a, 2010a).

The analysis area for direct and indirect effects on IRAs comprises the 13 IRAs and other uninventoried roadless lands within five miles of the SGP area (**Figure 3.23-3**).

The analysis area for RNAs are the RNAs that are within five miles of SGP facilities, which include Belvidere Creek and Chilcoot Peak (**Figure 3.23-4**).

#### 3.23.3 Relevant Laws, Regulations, Policies, and Plans

Several laws and implementing regulations apply to the Proposed Action and Alternatives. The following is a list of laws, regulations, policies, and plans at the federal, state, or local level pertaining to special designations. Additional descriptions and complete guidelines for implementation of these regulations can be found in the SGP Special Designations Specialist Report (Forest Service 2022p).

National Forest Land and Resource Management Plans (Wilderness): Management direction in FCRNRW Management Plan is derived from the Wilderness Act and subsequent legislation that aimed to protect these special areas and preserve wilderness character (11 USC 1131). One requirement that defines Wilderness is a roadless, undeveloped condition (Forest Service 2003a, 2010a).
The Payette Forest Plan and the Boise Forest Plan (Forest Service 2003a, 2010a) also have standards and guidelines for designated wilderness and recommended wilderness areas. The desired condition for people visiting wilderness in the National Forest is to find outstanding opportunities for primitive and unconfined recreation, including exploration, solitude, risk, and challenge. Wilderness areas are primarily affected by the forces of nature, with human imprint being substantially unnoticeable. For recommended wilderness areas, the Forest Service preserves the unique wilderness character of these areas until Congress acts on the Forest Service recommendation.

The Payette Forest Plan and the Boise Forest Plan include management prescriptions and practices for specific areas, including designated wilderness (MPC 1.1) and recommended wilderness (MPC 1.2). The goal of MPC 1.1 is to “Protect wilderness values as defined in the 1964 Wilderness Act. Improve opportunities and experiences through the development of individual wilderness management plans, partnerships with permittees and user groups, and interpretive and educational opportunities”. The goal of MPC 1.2 is to manage recommended wilderness to protect wilderness values as defined in the Wilderness Act. Activities permitted in recommended wilderness must not compromise wilderness values or reduce the area's potential for wilderness designation.

National Forest and Resource Management Plans (WSRs): Per the WSR Act, the Forest Service manages river segments and their corridors that are eligible or suitable for inclusion in the National System to retain their free-flowing status; water quality; WSR classification; and outstandingly remarkable values for scenery, wildlife, cultural, fish, geology, hydrology, ecological, or botanical resources, as applicable. The Payette Forest Plan and the Boise Forest Plan provide direction for managing WSRs via applicable standards and guidelines under these forest plans for providing direction and assessing impacts on eligible, suitable, and designated WSRs.

National Forest Land and Resource Management Plans (IRAs): One requirement for Wilderness is a roadless, undeveloped condition. Forest-wide guidelines from the PNF and BNF applicable to the IRAs include non-conforming uses in recommended wilderness areas and review of boundaries of IRAs during project-level planning. The Idaho Roadless Rule authorized administrative corrections to maps to address clerical or typographic errors. PNF and BNF forest-wide standards for IRAs and lands contiguous to unroaded areas provide general direction that management actions may only degrade aquatic, terrestrial, and watershed resource conditions for up to three years, and there are standards for construction of new roads in Riparian Conservation Areas. These plans also contain direction regarding application of standards and other direction to mineral activity; focused on mitigation of effects. The Salmon-Challis National Forest forest-wide standard for wilderness corridors prohibits land-disturbing activities, except legal mineral exploration, development, or other mining related activity, that would degrade the wilderness characteristics.

National Forest Land and Resource Management Plans (RNAs): The Payette Forest Plan and Boise Forest Plan describe desired future conditions in RNAs as areas where ecological processes generally prevail and remain largely undisturbed by human uses or activities. Per the Plans, RNAs provide quality opportunities for non-manipulative scientific research, monitoring, observation, and study. Management plans have been developed and implemented for all RNAs (Forest Service 2003a, 2010a).
Figure 3.23-2
Wild & Scenic Rivers
Stibnite Gold Project
Stibnite, ID

Figure 3.23-3
Inventoried Roadless Areas and Lands Contiguous to Unroaded Areas
Stibnite Gold Project Stibnite, ID
Figure 3.23-4
Research Natural Areas
Stibnite Gold Project
Stibnite, ID

Legend
Research Natural Area (Analysis Area)
Other Features
U.S. Forest Service
County
City/Town
Monumental Summit
Railroad
Highway
Road
Stream/River
Lake/Reservoir
Surface Land Management
Bureau of Land Management
Bureau of Reclamation
Private
State
U.S. Forest Service

Base Layer: USGS The National Map: 3D Elevation Program.
USGS Earth Resources Observation & Science (EROS) Center:
Other Data Sources: Midas Gold; State of Idaho Geospatial
Gateway (INSIDE Idaho); Boise National Forest; Payette
National Forest

Legend Box
5 0 2 4
Miles
1 inch = 4 miles
when printed at 11x17

Adams County
Gem County
Boise National Forest
Payette National Forest
Salmon-Challis National Forest
Frank Church-River of No Return Wilderness
Valley County
Custer County

Stibnite Gold Project Area
Project Area

Base Layer: USGS The National Map: 3D Elevation Program.
USGS Earth Resources Observation & Science (EROS) Center:
Other Data Sources: Midas Gold; State of Idaho Geospatial
Gateway (INSIDE Idaho); Boise National Forest; Payette
National Forest

Legend Box
5 0 2 4
Miles
1 inch = 4 miles
when printed at 11x17
Wilderness Act of 1964 (Wilderness): The Wilderness Act of 1964 mandates that “each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area (Section 4(b)).” The Wilderness Act identifies the five qualities of wilderness: untrammeled, natural, undeveloped, outstanding opportunities. Definitions of each are further provided in the Special Designations Specialist Report (Forest Service 2022p). Section 2(c)(4) of the Wilderness Act says these areas “may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.” Some of these features, such as the presence of threatened and endangered species, also are part of the natural quality of a wilderness. Other features of value must be just as rigorously protected as the qualities of wilderness character (Arthur Carhart National Wilderness Training Center 2014).

The FSH-1909.12 (Chapter 7) discusses these attributes of wilderness and discusses additional attributes to be considered in evaluating potential wilderness areas. These values include the contributions of wilderness to cultural and historic preservation; opportunities for self-discovery, self-reliance, and challenge; the scenic beauty of an area; and individual and social well-being.

Wilderness Act of 1964 (IRAs): The Wilderness Act of 1964 (16 USC 1131(note), 1131-1136) gives the statutory definition of wilderness (Section 2[c]), which helps define the evaluation process for potential wilderness in this planning process.

36 CFR 219.7 Special Designations (IRAs): Subpart a of 36 CFR 219.7 Special Designations describes the process for evaluating areas that may be suitable for inclusion in the National Wilderness System, which must be identified as part of the planning process, along with recommendations for wilderness designation. Inventories of lands that may be suitable for inclusion in the National Wilderness Preservation System are conducted following direction in FSH 1909.12—Land Management Planning Handbook, Chapter 70 Wilderness, which includes size and road improvement criteria.

36 CFR 293 (Wilderness – Primitive Areas): Federal policy related to designated wilderness areas in the NFS can be found in 36 CFR 293. The objectives related to wilderness can be found in 36 CFR 293.2. Forest Service policy related to the management of designated wilderness lands can be found in FSM 2320 – Wilderness Management.

Wild and Scenic Rivers Act: The National WSR System was created by Congress in 1968 (Public Law 90-542; 16 United States Code [USC] 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition. There are four steps in the WSRs process under the Act, including Inventory, Eligibility Determination, Classification, and Suitability Determination. As discussed in more detail below, the PNF and BNF have previously performed the first three of these steps for waterways in and around the SGP area and completed Suitability Determination for the SFSR.

River Management Provisions: The WSR Act requires agencies to protect rivers that they have identified as having “outstandingly remarkable values,” free-flowing condition, and associated water quality. The requirements and processes to protect these river values through coordinated federal actions are detailed in several sections of the WSR Act. Specific management prescriptions for eligible river segments include free-flowing values, outstandingly remarkable values, and classification impacts.
Section 7 of the WSR Act: Section 7(a) of the WSR Act provides a specific standard for review of developments on or directly affecting a designated WSR river segment. Development may occur if the project “will not invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area as of the date of designation…” This standard applies to projects outside the designated river corridor but on the same river or a tributary. None of the streams or rivers in the analysis area are designated WSRs, and a Section 7 analysis is conducted for federal water resources projects (i.e., located below the ordinary high-water mark); therefore, it is not applicable to the Project.

Visual Management System: The Forest Service is directed by policy to inventory, classify, and manage lands for their scenic resource values. Scenic resources are managed through VQOs designed to provide measurable standards that direct levels of acceptable visual change (Forest Service 1974b). The range of VQO categories includes Preservation, Retention, Partial Retention, Modification, and Maximum Modification. Per forest-wide standards and guidelines contained in the Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a), VQOs are assigned to eligible and suitable WSR segments based on their preliminary classification: preservation to a wild classification, retention to a scenic classification, and partial retention to a recreational classification.

Organic Administration Act of 1897 (RNA): The general provisions of the Organic Administration Act of 1897 (16 USC 551) authorize the Secretary of Agriculture to designate RNAs. Under regulations at 7 CFR 2.60(a), the Secretary has delegated this authority to the chief of the Forest Service, who, pursuant to 36 CFR 251.23, selects and establishes RNAs as part of the continuing land and resource management planning process for NFS lands (36 CFR 219.7 and FSM 1922).

Forest Service Manual 4000 Research and Development, Chapter 4060 (RNA): Chapter 4060 of FSM 4000 provides direction for RNA management as part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on NFS lands. RNAs are managed for nonmanipulative research, observation, and study. The establishment of RNAs emerges from continuing land and resource management planning and associated environmental analyses (FSM 1920 and FSM 1950). An establishment record, indicating the purpose of establishment and description of land and resource values, is required for each RNA.”

Central Idaho Wilderness Act (Wilderness): On July 23, 1980, the U.S. Congress passed the Central Idaho Wilderness Act, Public Law 96-312. This act created the 2,361,767-acre River of No Return Wilderness. Senator Frank Church’s name was added in 1984 by Public Law 98-231 in recognition of his efforts in passing the Central Idaho Wilderness Act.

WSR State Regulations (WSR): No state regulations directly address eligible, suitable, or designated WSRs. The Idaho State Water Resources Board has not designated state-protected rivers in the Salmon River basin. The Idaho Stream Channel Protection Act requires that the stream channels of the State and their environment be protected against alteration for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty and water quality. As a result of the Stream Channel Protection Act, the IDWR must approve in advance any work proposed within the bed and banks of a continuously flowing stream.
Idaho Roadless Rule (IRA): The Idaho Roadless Rule (36 CFR 294 Subpart C) provides state-specific direction for the conservation of IRAs in the national forest in the state of Idaho. The Idaho Roadless Rule designated 250 IRAs and established five management themes that provide prohibitions with exceptions or conditioned permissions governing road construction, timber cutting, and mineral development (73 Federal Register 201 [61456-61496]).

3.23.4 Affected Environment

3.23.4.1 Wilderness

The FCRNRW covers over two million acres in central Idaho (Figure 3.23-1) and is the largest contiguous wilderness in the continental 48 states and the largest in the NFS. As the largest block of primitive and undeveloped land outside Alaska, this wilderness is of national importance (Forest Service 2003b). Recommended wilderness in the analysis area includes areas within the PNF and BNF east of McCall and north of Warm Lake. The FCRNRW and recommended wilderness areas include seven general land types: 1) lower river canyon lands; 2) upper river canyon lands; 3) rolling basin lands; 4) low relief fluvial lands; 5) steep volcanic lands; 6) steep granitic fluvial lands; and 7) glaciated lands. Elevations in the FCRNRW and recommended wilderness range from less than 2,000 feet in the lower river canyon bottoms to over 10,000 feet on higher mountain peaks (Forest Service 2009d).

The existing conditions of wilderness within the analysis area relative to the five qualities of wilderness identified in the Wilderness Act (untrammeled, natural, undeveloped, opportunities for solitude or primitive and unconfined recreation, and other features of value) are summarized in the following sections and discussed in further detail in the SGP Special Designations Specialist Report (Forest Service 2022p).

Untrammeled

The FCRNRW and recommended wilderness within the analysis area consist of large expanses where natural forces provide a wide and constantly changing variety of habitats and conditions. Natural ecological processes prevail, and many areas are unmanipulated by human activities. Wilderness character in the FCRNRW is affected by its variety of uses; however, wilderness retains a wild, uncontrolled nature that is indicative of its untrammeled character. The FCRNRW is actively managed for control of non-native invasive plant species to help maintain native plant communities. Invasive weed sites along Big Creek and the Middle Fork Salmon River have been identified (Forest Service 2007a); implementation of the Forest Service’s noxious/invasive weed management program in the FCRNRW includes the use of herbicides and restoration of weed sites to a native plant community. The Valley County weed program identifies the presence of 18 noxious weeds and non-native invasive plant species in the FCRNRW and recommended wilderness areas (Valley County 2019d).

Natural

Natural ecological systems inside the FCRNRW and recommended wilderness have been, and continue to be, affected by conditions and actions (including human actions outside of wilderness) beyond the wilderness boundary. The tributaries to the East Fork and the Middle Fork of the Salmon River provide natural conditions that range from good to excellent in terms of water quality for domestic use,
recreational use, and wildlife in the wilderness. Water quality is functioning at risk in localized areas due to sedimentation impacts from historical livestock grazing, compounded by naturally high sediment rates, discussed further in Section 3.9 and the SGP Surface Water and Groundwater Quality Specialist Report (Forest Service 2022f).

In the FCRNRW and recommended wilderness areas, habitat alterations due to fires in the wilderness have created brush fields, lodgepole pine stands, snag patches, and variations in species and age classes of vegetation (Forest Service 2003b; Herron and Freeman 2008). Following a fire, especially in areas that burned with high intensity, the potential for noxious/invasive weed invasion increases (Brooks and Lusk 2008). Weed managers in the FCRNRW have observed the spread of noxious/invasive weeds into burned areas, especially adjacent to existing weed sites (Forest Service 2007a).

Terrestrial habitat is at or near natural functioning condition with low levels of disturbance and fragmentation (Forest Service 2010a). Non-native wildlife species introduced into the wilderness prior to designation include chukar partridge and gray (Hungarian) partridge. The FCRNRW provides habitat for native resident and anadromous fish species. California golden trout and Arctic grayling have been introduced into some lakes and streams (Herron and Freeman 2008).

The “airshed” associated with the FCRNRW (Class II airshed) consists of areas both directly above the wilderness, as well as areas above lands adjacent to its boundary. Management of air quality in the FCRNRW includes monitoring to ensure that outside influences are not degrading the air quality beyond the Clean Air Act Class II standards. Existing air quality conditions and Class II standards are discussed in Section 3.

Undeveloped

Human development in the FCRNRW and recommended wilderness is mostly associated with visitor use, such as trailheads and backcountry airstrips. Aircraft use is prevalent during the late spring and summer months; during winter, backcountry flights are generally associated with flights into established airstrips, including those on private inholdings. Along the western wilderness boundary of the FCRNRW, access roads are dirt roads with high elevation passes that are closed by snow during the winter. Access roads to the FCRNRW and recommended wilderness areas also are dirt roads, except for the SFSR Road, and are further detailed in the SGP Special Designations Specialist Report (Forest Service 2022p).

Additional human development in the FCRNRW includes a very high frequency repeater site at Artillery Dome, Forest Service guard stations and patrol cabins, Big Creek and Indian Creek public airstrips, and private airstrips.

Opportunities for Solitude or Primitive and Unconfined Recreation

The FCRNRW and recommended wilderness areas provide a wide variety of user opportunities for exploration, solitude, natural environment, risk, challenge, and primitive and unconfined recreation. Visitors use outfitter and guide services in the FCRNRW and recommended wilderness areas to take part in hiking, horseback riding, hunting, fishing, floating, and rafting.
In areas away from access roads, trailheads, administrative sites, and other areas of concentrated use, the FCRNRW and the recommended wilderness areas offer outstanding opportunities for solitude and primitive and unconfined recreation during all seasons.

**Other Features of Value**

The FCRNRW and recommended wilderness areas also preserve “ecological, geological, or other features of scientific, educational, scenic, or historic value,” as identified in section 2(c) of the Wilderness Act. This quality captures important elements of the wilderness, such as cultural or paleontological resources, that may not be covered in the other four qualities.

3.23.4.2 Wild and Scenic Rivers

Rivers in the PNF, BNF, and nearby Sawtooth National Forest were evaluated in 1997 in order to determine their eligibility for inclusion in the National System (Forest Service 2010a). The 1997 WSR study evaluated 889 streams and identified 45 with potential ORVs. These 45 streams were segmented and assigned preliminary classifications of recreational, scenic, or wild.

The analysis area for WSRs includes three of the streams identified as eligible during the 1997 study including the SFSR, Burntlog Creek, and Johnson Creek. A suitability study for the SFSR was performed as part of the Payette Forest Plan in 2003, and the SFSR was determined to be suitable (Forest Service 2003a). These waterbodies and their ORVs are briefly summarized below and further discussed in the SGP Special Designations Specialist Report (Forest Service 2022p). The SGP would intersect WSR corridors at the proposed access roads and utility corridors.

**South Fork Salmon River**

A combined suitability study of the PNF and BNF concluded that the SFSR is suitable for WSR designation. The SGP transmission line upgrade intersects the SFSR at the Warm Lake Road crossing of the river where the existing transmission line is located (Figure 6-1 of the SGP Special Designations Specialist Report [Forest Service 2022p]). This river segment is in BNF MA 19 Warm Lake and is estimated at 27.5 miles.

The river has a preliminary WSR classification of recreational. Recreational segments have a designated VQo of partial retention. The SFSR is recognized for the following ORVs: recreation, scenic, geological, cultural, botanical, and fisheries (Forest Service 2003a). SFSR Road is an asphalt road that parallels the SFSR and is compatible with the recreational classification of the river.

The IDEQ has designated total maximum daily load targets for sediment on the SFSR; however, detailed baseline data for existing water quality where the SGP components intersect the SFSR at Warm Lake Road have not been compiled (IDEQ 2011).

**Burntlog Creek**

Burntlog Creek, located in MA 20 Upper Johnson Creek, is eligible for inclusion in the National System from its headwaters to its confluence with Johnson Creek. Burntlog Creek has an ORV for fish (Forest
Service 2010a), as it is a Pacfish/Infish priority watershed that supports spawning and rearing habitat for wild Chinook salmon, steelhead, cutthroat trout, redband trout, and bull trout. From its headwaters to the crossing of Burnt Log Road, Burntlog Creek is eligible as a recreational river and is eligible as a wild river downstream of Burnt Log Road (Figure 6-2 of the SGP Special Designations Specialist Report [Forest Service 2022p]). The VQO for the recreational segment is partial retention. The VQO for the wild segment is preservation.

Burnt Log Road separates the recreational segment of Burntlog Creek upstream of the road from the wild segment downstream. The road includes turnouts and is infrequently groomed as a snowmobile route in winter and includes a culvert crossing at Burntlog Creek.

From downstream of the Burnt Log Road crossing to its confluence with Johnson Creek, the waterway has a preliminary classification as wild that is estimated to be 10.9 miles. This segment also is in the Burntlog IRA (Forest Service 2010a). There are no utility rights-of-way located in the Burntlog Creek corridor.

The upper segment of Burntlog Creek, from its headwaters to where it crosses Burnt Log Road, has a preliminary classification of recreational; this segment is approximately 1.9-miles.

Detailed baseline information on existing water quality in Burntlog Creek has not been compiled for the SGP. IDEQ has evaluated beneficial uses for the creek, rating it 2.67 on a scale where a score of 3 or higher indicates that it fully supports macroinvertebrate, fish, and aquatic habitat functioning (IDEQ 2011).

**Johnson Creek**

An approximately 2.9-mile segment of Johnson Creek located in BNF MA 21 that is paralleled by Johnson Creek Road is eligible for inclusion in the National System, with a preliminary classification of recreational (Figure 6-3 of the SGP Special Designations Specialist Report [Forest Service 2022p]). The VQO for Recreational WSR segments is partial retention. This reach of Johnson Creek is eligible for WSR status because of its ORV for cultural (heritage) resources. Any historic properties located within the 2.9-mile eligible corridor would contribute to its Heritage ORV (Forest Service 2010a), such as the existing Idaho Power Company Line 328 (transmission line) that is recognized as a contributing Heritage resource and would be replaced with a higher-capacity line as part of the SGP.

The IDEQ lists Johnson Creek on its 303(d) list of impaired waters, due to temperature (IDEQ 2011), which routinely exceeds the 10-degrees Celsius (50-degrees Fahrenheit) guideline for bull trout spawning in the summer.

### 3.23.4.3 Inventoried Roadless Areas

The analysis area contains portions of 13 IRAs identified in the Idaho Roadless Rule. The management themes in the 2008 Idaho Roadless Rule beginning from most to least restrictive are: Wild Land Recreation; Special Areas of Historic or Tribal Significance; Primitive; Backcountry/Restoration; and General Forest, Range, and Grassland. The themes provide an array of permitted and prohibited activities regarding timber cutting, sale, or removal; road construction and reconstruction; and mineral activities. A
sixth designation, Forest Plan Special Areas, was used to identify areas managed by forest plans for specific uses, such as WSRs, RNAs, or other specific purposes identified in forest plans. These areas are managed under the Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a); the Idaho Roadless Rule does not apply to these areas (Forest Service 2008b, 2008c).

Table 3.23-1 displays the acreages in the Idaho Roadless Rule management classifications for the portions of the 13 IRAs managed by the PNF and BNF.

Table 3.23-1 Management Classifications of PNF IRAs

<table>
<thead>
<tr>
<th>Roadless Area Name</th>
<th>Primitive Acres</th>
<th>Wild Land Recreation Acres</th>
<th>Forest Plan Special Area Acres</th>
<th>Backcountry Restoration Acres</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caton Lake</td>
<td>0</td>
<td>0</td>
<td>2,049</td>
<td>43,377</td>
<td>45,426</td>
</tr>
<tr>
<td>Horse Heaven</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>13,446</td>
<td>13,446</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,007</td>
<td>8,007</td>
</tr>
<tr>
<td>Needles</td>
<td>7,022</td>
<td>90,230</td>
<td>2,534</td>
<td>31,493</td>
<td>131,279</td>
</tr>
<tr>
<td>Secesh</td>
<td>7,720</td>
<td>110,255</td>
<td>10,545</td>
<td>119,568</td>
<td>248,088</td>
</tr>
<tr>
<td>Sugar Mountain</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10,340</td>
<td>10,340</td>
</tr>
<tr>
<td>Total</td>
<td>14,742</td>
<td>200,485</td>
<td>15,128</td>
<td>226,231</td>
<td>456,586</td>
</tr>
</tbody>
</table>

Source: Forest Service 2003a, 2008a

Table 3.23-2 lists the IRA management areas and MPCs as administered by the PNF or BNF. The IRAs in the analysis area include 1,841 acres recommended for wilderness inclusion (MPC 1.2) in the Payette Forest Plan (Forest Service 2003a). MPCs for both PNF and BNF are described as follows:

- 1.2 – Wilderness Inclusion
- 2.2 – Research Natural Area
- 3.1 – Passive Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources
• 3.2 – Active Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources
• 4.1c – Recreation: Maintain Unroaded Character with Allowance for Restoration Activities
• 4.2 – Roaded Recreation Emphasis
5.1 – Restoration and Maintenance Emphasis within Forested Landscapes

Table 3.23-2  Management Areas and Management Prescription Categories for IRAs in the Analysis Area

<table>
<thead>
<tr>
<th>Forest Area and MA</th>
<th>MPC 1.2 Acres</th>
<th>MPC 2.2 Acres</th>
<th>MPC 3.1 Acres</th>
<th>MPC 3.2 Acres</th>
<th>MPC 4.1c Acres</th>
<th>MPC 5.1 Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payette National Forest MA 13 Big Creek/Stibnite</td>
<td>0</td>
<td>0</td>
<td>37,308</td>
<td>8,021</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Payette National Forest MA 12 SFSR</td>
<td>1,841</td>
<td>0</td>
<td>7,392</td>
<td>9,036</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 18 Cascade Reservoir</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3,058</td>
</tr>
<tr>
<td>Boise National Forest MA 13 Deadwood River</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 21 Lower Johnson Creek</td>
<td>0</td>
<td>808</td>
<td>9,738</td>
<td>25,234</td>
<td>20,177</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 17 North Fork Payette River</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,336</td>
</tr>
<tr>
<td>Boise National Forest MA 20 Upper Johnson Creek</td>
<td>0</td>
<td>0</td>
<td>52,547</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 15 Upper Middle Fork Payette River</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>1,659</td>
</tr>
<tr>
<td>Boise National Forest MA 19 Warm Lake</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>37,868</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1,841</td>
<td>808</td>
<td>107,095</td>
<td>80,164</td>
<td>20,182</td>
<td>10,053</td>
</tr>
</tbody>
</table>

Source: Forest Service 2003a, 2010a

The lands contiguous to unroaded areas are areas with acreages of less than 5,000 acres and are adjacent to an IRA or the FCRNRW boundary (Forest Service 2010a). Table 3.23-3 lists the MPCs for the approximately 9,361 acres of lands in the analysis area that are contiguous to unroaded areas administered by the BNF or the Salmon-Challis National Forest shown on Figure 6-4 of the SGP Special Designations Specialist Report (Forest Service 2022p). Lands contiguous to unroaded areas include 882 acres recommended for wilderness inclusion in the Boise Forest Plan (Forest Service 2010a) and 1,084 managed as Wilderness Corridor under the 1987 Salmon-Challis Forest Plan.
Table 3.23-3 Management Areas and Management Prescription Categories for Lands Contiguous to Unroaded Areas in the Analysis Area

<table>
<thead>
<tr>
<th>Forest Area and MA</th>
<th>MPC 1.2 Acres</th>
<th>MPC 3.1 Acres</th>
<th>MPC 3.2 Acre</th>
<th>MPC 4.2 Acres</th>
<th>MPC 5.1 Acres</th>
<th>Wilderness Corridor Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boise National Forest MA 17 North Fork Payette River</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>112</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 19 Warm Lake</td>
<td>0</td>
<td>0</td>
<td>2,954</td>
<td>592</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boise National Forest MA 20 Upper Johnson Creek</td>
<td>0</td>
<td>192</td>
<td>2,518</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Payette National Forest MA 12 SFSR</td>
<td>882</td>
<td>0</td>
<td>2,248</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Salmon-Challis National Forest MA 24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,084</td>
</tr>
<tr>
<td>Total</td>
<td>882</td>
<td>192</td>
<td>7,720</td>
<td>592</td>
<td>112</td>
<td>1,084</td>
</tr>
</tbody>
</table>

Source: Forest Service 1987, 2003a, 2010a

FSH 1909.12, 72.1 discusses the five wilderness attributes identified in the Wilderness Act of 1964. These five wilderness attributes are used to describe the existing conditions in the IRAs and the lands contiguous to unroaded areas (FSH 1909.12-2015 (72.1)). An in-depth description of the condition of each of the roadless areas in the forest and the condition and character of each of the areas is further described in the FEIS for the Idaho Final Roadless Rule (Forest Service 2008b). Table 3.23-4 displays how roadless characteristics are incorporated into the analysis of the effect for wilderness attributes for roadless expanse, which includes the IRAs and the lands contiguous to unroaded areas.

Table 3.23-4 Wilderness Attributes and Corresponding Roadless Area Characteristics

<table>
<thead>
<tr>
<th>Wilderness Attributes</th>
<th>Roadless Area Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural</strong>: Extent to which the area’s ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature.</td>
<td>• High quality or undisturbed soil, water, and air sources of public drinking water • Diversity of plant and animal communities • Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land</td>
</tr>
<tr>
<td><strong>Undeveloped</strong>: Degree to which the area is without permanent improvements or human habitation.</td>
<td>• Reference Landscapes • Natural appearing landscapes with high scenic quality</td>
</tr>
</tbody>
</table>
Table 3.23-5  IRAs and Land Contiguous to Unroaded Areas Natural Integrity and Appearance

<table>
<thead>
<tr>
<th>Roadless Area Name</th>
<th>Natural Integrity and Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard</td>
<td>There is approximately 0.1 mile of NFS road in the IRA and historic mining sites have been located along the Deadwood River. There are 21 mining claims in the IRA.</td>
</tr>
<tr>
<td>Black Lake</td>
<td>The integrity of the area has been affected in some locations by historic mining activity.</td>
</tr>
<tr>
<td>Burnt Log</td>
<td>There are approximately 12 miles of NFS roads and 14 miles of trails open to motorized use in the IRA.</td>
</tr>
<tr>
<td>Caton Lake</td>
<td>There are approximately 40 miles of trails open to motorized use in the IRA, and there are an estimated 1.25 miles of unauthorized roads within the IRA.</td>
</tr>
<tr>
<td>Roadless Area Name</td>
<td>Natural Integrity and Appearance</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Horse Heaven</td>
<td>There is approximately 0.2 mile of unauthorized NFS road and 40 miles of trails open to motorized use in the IRA. Scattered mining claims occur within the IRA and past mining is evident in portions of the IRA.</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>There are an estimated 15 miles of trails open to motorized use and 2.9 miles of NFS roads within the IRA. Surrounding and intruding roads, a telephone infrastructure corridor, and scattered historic mining-related disturbance detract from the natural integrity in some portions of the area.</td>
</tr>
<tr>
<td>Needles</td>
<td>There are an estimated 132 miles of trails open to motorized use and 0.1 mile of NFS roads within the IRA. There also are an estimated 30 miles of unauthorized roads in the IRA.</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>There are an estimated 15 miles of trails open to motorized use and 2.9 miles of NFS roads within the IRA. Surrounding and intruding roads, a telephone infrastructure corridor, and scattered historic mining-related disturbance detract from the natural integrity in some portions of the area.</td>
</tr>
<tr>
<td>Reeves Creek</td>
<td>There is approximately 0.2 mile of NFS road and 20 mining claims within the IRA.</td>
</tr>
<tr>
<td>Seeceh</td>
<td>There are an estimated 0.8 mile of NFS roads and Valley County roads within the IRA and 194 miles of trails open to motorized use. Past mining activity occurred in Ruby and Willow Basket creeks and around Seeceh Meadows.</td>
</tr>
<tr>
<td>Stony Meadows</td>
<td>There are approximately 5.4 miles of trails open to motorized use, and, during the winter, there is a plowed road on the north side of the IRA and a groomed snowmobile trail along the east side.</td>
</tr>
<tr>
<td>Sugar Mountain</td>
<td>An estimated 1.1 miles of unauthorized roads are within the IRA, and 1 mile of the trail is open to motorized use.</td>
</tr>
<tr>
<td>Whiskey</td>
<td>There are 1.5 miles of trails open to motorized use and approximately 0.2 mile of NFS roads in the IRA.</td>
</tr>
</tbody>
</table>

Source: Forest Service 2008b

The specific miles for roads and trails are from Final Idaho Roadless Area EIS Volume 4 Appendix C Boise, Payette, and Sawtooth.

**Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation**

The 13 IRAs, including the adjacent unroaded areas, provide recreation opportunities, such as camping, canoeing, cross-country skiing, fishing, hiking, hunting, picnicking, and wildlife viewing. The outstanding opportunities for solitude or primitive and unconfined recreation vary throughout the roadless expanse. Outstanding opportunities for solitude are high in areas of the roadless expanse due to the topography, vegetation, and distance to large population centers. Opportunities for solitude are good in the Meadow Creek IRA around Riordan Lake, which is sheltered by extensive vegetation and small draws. However, in the areas where the roadless expanse is adjacent to heavily used access roads and trails that allow motorized use, the outstanding opportunities for solitude are limited. Opportunities for solitude are limited in some areas due to the loss of vegetative screening from past wildfires. In areas of the roadless expanse that are narrower than 1 mile, the irregular and complex shape limits opportunities for solitude.
The topography and climate in the roadless expanse provide opportunities for primitive and challenging recreational activities. Except for motorcycle or all-terrain vehicle recreation, most existing recreation use is of a primitive type (e.g., hiking, backpacking, stock use and trail riding, big and small game hunting, and primitive recreation). Locations where the roadless expanse is narrow, and there are cherry-stemmed road exclusions, limit opportunities for primitive recreation.

The physical setting of the ROS class is defined by the absence or presence of human sights and sounds, physical size of an area, and the amount of environmental modification caused by human activity (Forest Service 1982; Johnson et al. 2005). The Recreation Specialist Report (Forest Service 2022m) discusses summer and winter ROS classes in more detail. The physical setting ROS acres in the roadless expanse during summer is 129,437 acres of the roadless expanse in the analysis area meet the semi-primitive non-motorized setting and provide visitors a high probability of getting away from the sights and sounds of other people. A total of 45,000 acres of the roadless expanse meet the semi-primitive motorized setting during summer, providing visitors with a moderate probability of getting away from sights and sounds of other people.

During winter, 140,991 acres of the roadless expanse in the analysis area meet the semi-primitive non-motorized setting and 40 acres meet the primitive setting. These areas provide visitors with a high probability of getting away from the sights and sounds of other people. There are 11,496 acres of the roadless expanse that meet the semi-primitive motorized groomed setting and 85,244 acres that meet the semi-primitive motorized setting during winter, providing visitors with a moderate probability of getting away from sights and sounds of other people.

**Special Features**

In each of the 13 IRAs, there are locally identified unique characteristics and values. These special features include areas valued for their scientific qualities, scenic qualities, or other notable distinct features. Table 3.23-6 describes special features identified for the IRAs in the analysis area, including areas where habitat modeling indicates special status plant species occur, as shown in the SGP Vegetation Specialist Report (Forest Service 2022g).

<table>
<thead>
<tr>
<th>Roadless Area Name</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard</td>
<td>No special features identified.</td>
</tr>
<tr>
<td>Black Lake</td>
<td>A total of 82 acres of the 1,290-acre Chilcoot Peak RNA are in this IRA. Habitat modeling indicates 19 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Burnt Log</td>
<td>A total of 700 acres of the 1,290-acre Chilcoot Peak RNA are in this IRA. A total of 3,100 acres of the Burnt Log Creek corridor, which is eligible for WSR designation, bisects the IRA. Habitat modeling indicates 22 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Caton Lake</td>
<td>Caton Lake and other alpine lakes are special features, along with the 1,100-acre Phoebe Meadows RNA. Habitat modeling indicates 18 special status plant species may be found in this area.</td>
</tr>
</tbody>
</table>
### Roadless Area Name

<table>
<thead>
<tr>
<th>Roadless Area Name</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horse Heaven</td>
<td>An elk security area, which is analogous to elk winter range, lies in the north end of the IRA. Habitat modeling indicates 28 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>Riordan Lake, Meadow Creek Lookout, and about 100 acres of the Johnson Creek WSR eligible corridor are special features in this IRA. Habitat modeling indicates 25 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Needles</td>
<td>Includes 2,327 acres of contiguous lands. The Needles geologic formation, a scenic landmark, and the 985-acre Needles RNA are in the IRA. Habitat modeling indicates three special status plant species may be found within this area.</td>
</tr>
<tr>
<td>Peace Rock</td>
<td>Includes 1,363 acres of contiguous lands. About 1,300 acres of Back Creek RNA are located in the IRA. Habitat modeling indicates four special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Reeves Creek</td>
<td>Habitat modeling indicates 22 special status plant species may be found in the area.</td>
</tr>
<tr>
<td>Secech</td>
<td>Includes 275 acres of contiguous lands. Elk winter range occurs along the East Fork SFSR and along the SFSR in this IRA, and 1,464 acres include the Circle End Creek RNA. Approximately 700 acres are part of the Yellow Pine Water Users watershed. Habitat modeling indicates 17 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Stony Meadows</td>
<td>Includes 112 acres of contiguous lands. Curtis Lake is a high elevation lake of special interest. Habitat modeling indicates two special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Sugar Mountain</td>
<td>Sugar Mountain and Missouri Ridge are prominent landmarks. A big game migration route passes near Sugar Mountain. Habitat modeling indicates 15 special status plant species may be found in this area.</td>
</tr>
<tr>
<td>Whiskey</td>
<td>Habitat modeling indicates 11 special status plant species may be found in this area.</td>
</tr>
</tbody>
</table>

Source: AECOM 2020a; Forest Service 2008b

### Manageability

Manageability refers to the ability to manage an area to maintain roadless characteristics. A total of 2,723 acres in the analysis area of Needles and Secech IRAs are recommended for wilderness in the Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a). Areas of the roadless expanse with complex and irregular boundaries from intersecting roads or private lands and small IRA areas make it more difficult to define and administer the area to maintain roadless characteristics. In addition, boundaries for parts of IRAs in the roadless expanse are difficult to identify on the ground and difficult to administer due to their remoteness. **Table 3.23-7** describes the manageability of the roadless expanse for each of the 13 IRAs and the contiguous unroaded area.
### Table 3.23-7  IRAs and Lands Contiguous to Unroaded Areas Manageability

<table>
<thead>
<tr>
<th>Roadless Area Name</th>
<th>Manageability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard</td>
<td>Bernard IRA has some very complex and irregular boundaries due to the long exclusion of the road along Sulphur Creek.</td>
</tr>
<tr>
<td>Includes 306 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Black Lake</td>
<td>Black Lake IRA is less than 5,000 acres.</td>
</tr>
<tr>
<td>Includes 1,084 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Burnt Log</td>
<td>Burnt Log IRA has very complex and irregular boundaries.</td>
</tr>
<tr>
<td>Includes 909 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Caton Lake</td>
<td>Caton Lake IRA is relatively intact with defined boundaries.</td>
</tr>
<tr>
<td>Includes 989 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Horse Heaven</td>
<td>Mining development inclusions complicate managing the area.</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>Portions of Meadow Creek IRA have easily defined boundaries.</td>
</tr>
<tr>
<td>Includes 909 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Needles</td>
<td>The Needles IRA has some irregular boundaries.</td>
</tr>
<tr>
<td>Includes 1,506 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Peace Rock</td>
<td>Peace Rock IRA has very complex and irregular boundaries.</td>
</tr>
<tr>
<td>Includes 645 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Reeves Creek</td>
<td>Reeves Creek IRA has some irregular boundaries.</td>
</tr>
<tr>
<td>Includes 2,021 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Seech</td>
<td>Seech IRA is relatively intact with defined boundaries.</td>
</tr>
<tr>
<td>Includes 1,110 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Stony Meadows</td>
<td>Stoney Meadows IRA has some irregular boundaries.</td>
</tr>
<tr>
<td>Sugar Mountain</td>
<td>Sugar Mountain IRA has boundaries that may be difficult to manage due to past or future mining activity.</td>
</tr>
<tr>
<td>Includes 1,506 acres of contiguous lands</td>
<td></td>
</tr>
<tr>
<td>Whiskey</td>
<td>Whiskey IRA has very complex and irregular boundaries.</td>
</tr>
<tr>
<td>Includes 613 acres of contiguous lands</td>
<td></td>
</tr>
</tbody>
</table>

Source: Forest Service 2003a, 2008a, 2019b

### 3.23.4.4 Research Natural Area

The system of RNAs was established with the goal of allowing natural processes to occur without the influence of human activity. RNAs preserve natural features and plant communities for research and educational purposes and contribute to a national network of ecological areas dedicated to research, education, and the maintenance of biological diversity. These conditions are ordinarily achieved by allowing natural, physical, and biological processes to prevail without human intervention. RNAs that are representative of common ecosystems in natural conditions serve as baseline or reference areas. The two RNAs in the analysis area provide on-site and extension educational opportunities (Table 3.23-8).
Table 3.23-8  Research Natural Areas in the Analysis Area

<table>
<thead>
<tr>
<th>RNA</th>
<th>Forest</th>
<th>Management Area</th>
<th>Acres</th>
<th>Elevation in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belvidere Creek</td>
<td>PNF</td>
<td>MA 14 FCRNRW</td>
<td>2,920</td>
<td>6,200–9,273</td>
</tr>
<tr>
<td>Chilcoot Peak</td>
<td>BNF</td>
<td>MA 21 Lower Johnson Creek</td>
<td>1,294</td>
<td>7,250–8,998</td>
</tr>
</tbody>
</table>

Source: Forest Service 2017a

1 Size for each RNA is based on GIS data from the PNF and BNF.

Belvedere Creek RNA was established to preserve high elevation subalpine fir habitat types, outstanding aquatic features with associated wetland plant communities, and a unique and scenic geomorphic setting. Chilcoot Peak RNA was established to preserve diverse subalpine forest habitats, including subalpine fir, Douglas-fir, and whitebark pine (*Pinus albicaulis*) habitat types.

Complete descriptions of the RNAs are found in the establishment records (Forest Service 1995, 1996a-f) and are further detailed in the SGP Special Designations Specialist Report (Forest Service 2022p). Fire is an ecosystem process within these RNAs and is consistent with the values for which they are established. No formal studies have been conducted documenting if characteristic versus uncharacteristic fire has occurred; the evidence is based on field observations and indicates primarily characteristic fire behavior.

### 3.24 Tribal Rights and Interests

#### 3.24.1 Introduction

This report considers the rights and interests of federally-recognized American Indian Tribes (the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes [Tribes]) whose treaty fishing and hunting rights traditional subsistence range (or “traditional use area,” meaning, geographic areas commonly used for the provision of food, clothing, shelter, spiritual, and other purposes) includes the SGP area to determine the extent that tribal members would experience adverse effects to their tribal rights and interests as a result of the SGP. The locations of the associated reservations in relation to the SGP are shown on Figure 3.22-1.

“Tribal rights” refer to rights legally accruing to a tribe by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order (EO), or agreement, and which give rise to legally enforceable remedies.

“Tribal resources” is defined as natural resources retained by, reserved by, or for Indian tribes through treaties, statutes, judicial decisions, executive order, or agreement and that are protected by a fiduciary obligation on the part of the United States and in certain instances constitute interests in real property. In this report, tribal resources include the traditional fish, wildlife, and plants of importance to ancestral and modern descendant tribes, as well as the areas, sites, or waterways that have or support such resources. Tribal resources also include sacred sites used for spiritual and religious activities, traditional cultural properties (TCPs), and cultural landscapes (CLs).
“Interests” is used herein to refer to the concerns that individual tribes assert in particular places or concerns that certain activities could affect the landscape and resources within their traditional subsistence range.

3.24.2 Tribal Rights and Interests Resources Area of Analysis

The analysis area for tribal rights and interests includes the area where effects (direct/indirect and cumulative) may be caused by the proposed activities (FSH.1909.15, 15.2a). The analysis area for tribal rights and interests is the geographic area within which the SGP may directly or indirectly impact tribal real property interests or cause alterations in the character of tribal resources and in a tribe’s ability to exercise their rights for off-reservation tribal hunting, gathering, and pasturing activities, fishing in usual and accustomed places, access streams and fountains, and their ability to practice spiritual and religious activities that also are protected under federal laws (Figure 3.24-1). The Cascade Reservoir, Johnson Creek, Gold Fork River, Lower East Fork South Fork Salmon River (East Fork SFSR), Upper East Fork SFSR, and Upper South Fork Salmon River HUC10 watersheds would be the areas where the majority of SGP activity would take place. The Burntlog Route access road would be contained within the Johnson Creek and Upper East Fork SFSR watersheds. Because of the route’s proximity to the FCRNRW, the Upper Indian Creek subwatershed (which is part of the Upper Middle Fork Salmon watershed) plus the Upper Little Pistol Creek and Upper Pistol Creek watersheds are also included in the analysis area.

3.24.3 Relevant Laws, Regulations, Policies, and Plans

The interests of the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes go beyond spiritual, cultural, and economic to the unique legal relationship that the U.S. Government has with American Indian tribal governments and the U.S. Government’s trust responsibility (Forest Service Manual 1563.1b(1), Forest Service Manual 1563.8(b)). Federally recognized tribes are sovereign nations who work with the federal government, and its agencies, through the process of government-to-government consultation. The federal trust relationship with each tribe was recognized by, and has been addressed through, the U.S. Constitution, treaties, EOs, statutes, and court decisions. In general, these mandates protect and enhance the ability of the tribes to exercise rights and cultural practices off-reservation. Cultural interests and uses on National Forest System (NFS) lands are protected through various federal statutes. The federal trust requires federal agencies to manage the lands under their stewardship with full consideration of tribal rights and interests, particularly reserved rights, where they have been exercised since time immemorial.

Many of the treaties and EOs signed by the U.S. government in the mid-1800s reserved homelands for the tribes. Additionally, the treaties with the Nez Perce Tribe and Shoshone-Bannock Tribes reserved certain rights outside the established reservations, such as fishing, hunting, gathering, and pasturing, on what are now NFS land. Tribes still protect and exercise those rights throughout the analysis area.
LEGEND
- Tribal Resources Analysis Area
- Project Components
  - SGP Features
    - Burning Route *
    - Johnson Creek Route
  - Utilities
    - Transmission Line
    - U.S. Forest Service
    - Wilderness
    - County
    - City/Town
    - Highway
    - Road
    - Stream/River
    - Lake/Reservoir
- Surface Management Agency
  - Bureau of Land Management
  - Bureau of Reclamation
  - Private
  - State
  - State Fish and Game
  - State Parks and Recreation
  - U.S. Forest Service

* Associated with 2021 MMP only.

Stibnite Gold Project
Stibnite, ID

Figure 3.24-1
Tribal Resources Analysis Area
Stibnite Gold Project
Stibnite, ID

Legend: 2019 National Elevation Dataset
Data: Esri Source: Esri, National Geospatial-Intelligence Agency (USGSI data), Boise National Forest, Payette National Forest

Note: The McCall Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road) and Stibnite Road.
These reserved tribal rights as defined by statute, treaty, Executive Order, or court decision are protected. The United States holds many of these interests in trust for tribes and their members. The federal trust doctrine was first described by the Supreme Court in Cherokee Nation v. Georgia 30 U.S. (5 Pet.) 1 (1831). The United States holds the underlying title or interest to many of these reserved rights for the benefit of the tribe or tribes. The Forest Service obligations include management of NFS lands consistent with other federal laws and the protection of off-reservation rights.

The following excerpts from the treaties with the Nez Perce Tribe and Shoshone-Bannock Tribes, and the EO with the Shoshone-Paiute Tribes characterize the rights that the tribes have and where they can exercise those rights. Certain federal laws that pertain to the exercise of religion at Indian sacred sites also are included in this section. This is followed by a summary of Forest Service directives and plans pertaining to tribal rights.

**Nez Perce Tribe Treaties (1855 and 1863):** In 1854, Isaac Stevens, governor of the Washington Territory, began negotiations with area tribes. The Nez Perce Tribe Treaty of 1855, a Stevens treaty, established a 7.5-million-acre reservation and reserved rights to fish, hunt, gather, and pasture. Article 3 of the treaty identifies the following rights for the Nez Perce Tribe:

> The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians: as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory, and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land (Nez Perce Tribe Treaty of 1855, Article 3).

The Nez Perce Tribe Treaty of 1863 does not specifically list any off-reservation rights. However, Article 8 of this treaty secures the same rights as the 1855 treaty:

> ...as set forth in the eighth article of the treaty of June 11, 1855; and further, that all the provisions of said treaty which are not abrogated or specifically changed by any article herein contained, shall remain the same to all intents and purposes as formerly; - the same obligations resting upon the United States, the same privileges continue to the Indians outside of the reservation...

> ...The United States also agree to reserve all springs or fountains not adjacent to, or directly connected with, the streams or rivers within the lands hereby relinquished, and to keep back from settlement or entry so much of the surrounding land as may be necessary to prevent the said springs or fountains being enclosed; and, further, to preserve a perpetual right of way to and from the same, as watering places, for the use in common of both whites and Indians... (Nez Perce Tribe Treaty of 1863, Article 8).

The Stevens treaty secured three types of rights including hunting, gathering, and pasturing on open and unclaimed lands, fishing in usual and accustomed places, and through the additional Treaty of 1863, access to springs and fountains.

**Shoshone-Bannock Tribes Treaty (1868):** The Fort Bridger Treaty of 1868 (also known as the Shoshone Bannock Treaty) was the last reservation established through treaty council (Wikipedia 2022). The Fort Bridger Treaty with the Shoshone-Bannock Tribes set aside the Fort Hall Reservation in southeastern
Idaho for the Eastern Shoshone, including the Lemhi and the Bannock. It also reserved rights outside of established reservations, including hunting rights:

The Indians herein named agree, when the agency house and other buildings shall be constructed on their reservations named, they will make said reservations their permanent home, and they will make no permanent settlement elsewhere; but they shall have the right to hunt on unoccupied lands of the United States so long as game may be found thereon, and so long as peace subsists among the whites and Indians on the borders of the hunting districts (Fort Bridger Treaty of 1868, Article 4).

Additionally, on June 6, 1900, President McKinley signed the Fort Hall concession of lands (Idaho Centennial Commission Native Americans Committee [ICCNAC] 1992). This cession affirmed the off-reservation rights of the Fort Bridger Treaty stating, in Article IV of the concession agreement or Act, that:

So long as any of the lands ceded, granted, and relinquished under this treaty remain part of the public domain, Indians belonging to the above-mentioned tribes, and living on the reduced reservation, shall have the right, without any charge therefore, to cut timber for their own use, but not for sale, and to pasture their livestock on said public land, and to hunt thereon and to fish in the streams thereof.

Shoshone-Paiute Tribes Executive Order (1877): After 1868, reservations were established through presidential executive order (Wikipedia 2022). The Shoshone-Paiute Tribes EO of 1877, signed by United States President Rutherford B. Hayes, set aside the Duck Valley Reservation for several Western Shoshone bands who traditionally lived along the Owyhee River of southeastern Oregon, in southwestern Idaho, and along the Humboldt River of northeastern Nevada (Thomas et al. 1986). Later, they were joined by Paiute from the lower Weiser country of northeastern Nevada from the Fort McDermitt, Camp Harney, and Quinn River areas, as well as from the Owyhee region of southwestern Idaho. The aboriginal Northern Paiute territory includes portions of southwestern Idaho, eastern Oregon, and northwestern Nevada. Previous treaties with ancestral Shoshone-Paiute bands, such as the Ruby Valley Treaty of 1863 (ratified), Bruneau Treaty of 1864 (unratified), and Boise Treaty of 1866 (unratified), establish various rights (or do not extinguish rights), which has led to complex unresolved land claims and rights.

Land and Resource Management Plan: Forest Service Manual 1563 directs the Forest Service to implement programs and activities consistent with and respecting tribal rights and to fulfill legally mandated trust responsibilities to the extent they are determined applicable to NFS lands. Treaty rights and trust responsibilities are defined in Forest Service Manual 1500, Chapter 1560 as:

Those rights or interests reserved in treaties for the use and benefit of Tribes. The nature and extent of treaty rights are defined in each treaty. Only Congress may abolish or modify treaties or treaty rights. Trust responsibilities arise from the U.S.’s unique legal and political relationship with Indian tribes. It derives from the Federal Government’s consistent promise in the treaties that it signed, to protect the safety and well-being of the Indian tribes and tribal members. The federal trust responsibility is a legally enforceable fiduciary obligation on the part of the U.S. to carry out the mandates of federal law with respect to all federally recognized American Indian and Alaska Native tribes and villages (Forest Service 2016a:51).
The Payette National Forest Land and Resource Management Plan (Forest Service 2003a) and the Boise National Forest Land and Resource Management Plan (Forest Service 2010) also provide as part of the desired conditions that:

*Federal agencies take a more proactive role on the tribes’ behalf, especially in areas of treaty interest, rights, traditional and cultural resources, and ecosystem integrity. Federal agencies provide opportunities for traditional American Indian land uses and resources. The presence of healthy habitats is fundamental to the achievement of both useable and harvestable levels of resources significant to American Indians, as well, as to ecosystem integrity (Forest Service 2003a:III-71; Forest Service 2010: III-73).*

Forest Service Manual 1500, Chapter 1560 also summarizes the Forest Service responsibility to protect tribal cultural resources and sacred sites, as codified in legislation, regulations, and other statutory authorities. These apply to sites of historical importance and to sacred sites held sacred because of religious or spiritual importance.

**American Indian Religious Freedom Act (1978):** The American Indian Religious Freedom Act (42 United States Code 1996) promotes federal agency consultation with tribes on activities that may affect their traditional religious rights and cultural practices. These include, but are not limited to, access to sacred sites, freedom to worship through ceremonial and traditional rights, and use and possession of objects considered sacred. These rights and practices may be associated with, and lend significance to, a property. The American Indian Religious Freedom Act directs agencies to consult with Native American traditional religious leaders in a cooperative effort to develop and implement policies and procedures that will aid in determining how to protect and preserve Native American cultural and spiritual traditions.

**National Historic Preservation Act:** The National Historic Preservation Act (NHPA) of 1966, as amended through December 16, 2016 (Public Law [P.L.] 89-665, as amended by P.L. 96-515; 54 United States Code [USC] 300101 et seq.) is the principal federal law protecting historic properties. Section 106 of the NHPA (54 USC 306108) directs all federal agencies to consider the effect of their undertakings (i.e., actions, financial support, and authorizations) on any historic properties. The Advisory Council on Historic Preservation (ACHP) regulations at 36 CFR 800 implement Section 106. Procedures are outlined for identifying resources; evaluating their significance; assessing effects; implementing measures to mitigate adverse effects; and consulting with the ACHP, State Historic Preservation Offices (SHPOs,) Tribal Historic Preservation Offices, and other interested parties. The National Register of Historic Places (NRHP) is used as a planning tool under these regulations to help federal agencies evaluate the significance of cultural resources. Additionally, the NHPA requires federal agencies to consult with Indian tribes to determine whether there are properties of traditional religious and cultural importance to Indian tribes that may be eligible for listing on the NRHP (54 USC 302706).

Federal agencies are directed to identify an Area of Potential Effects (APE) when assessing the potential impacts to historic properties resulting from an undertaking that falls under the purview of Section 106. Per 36 CFR 800.16(d), an APE is defined as “…the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking…” The APE defines that area within which the
identification of historic properties will occur. While the APE is a NHPA-specific tool for assisting with identifying the potential effects of an undertaking it is also useful in identifying resources that may also require consideration in the context of tribal interests.

**Native American Graves Protection and Repatriation Act (NAGPRA) (1990):** The Native American Graves Protection and Repatriation Act (NAGPRA) became law in 1990; the regulations implementing the statute were completed and went into effect in January 1996. This law formally affirms the rights of Indian tribes, Native Alaskan entities, and Native Hawaiian organizations to custody of Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony with which they have a relationship of cultural affiliation. NAGPRA gives even stronger custody rights to lineal descendants when such a close relationship can be documented. In addition, the law and regulations describe procedures designed to ensure that all Americans can derive educational, historical, and scientific value from the remains and objects covered by the statute through public interpretation, documentation, and study. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native American cultural items on federal and tribal lands, and penalties for noncompliance and illegal trafficking.

**Executive Order 13007 (1996):** EO 13007 (Indian Sacred Sites) requires federal land managing agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. It also requires agencies to develop procedures for reasonable notification of proposed actions or land management policies that may restrict access to or ceremonial use of, or adversely affect, sacred sites.

Sacred sites are defined in EO 13007 as, “any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the Indian tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.”

**Executive Order 13175 (2000):** This EO (Consultation and Coordination with Indian Tribal Governments) establishes regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes. This order revokes the preceding EO 13084 – Consultation and Coordination with Indian Tribal Governments.

**Secretarial Order 3206 (1997):** This Order (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act) clarifies the responsibilities of federal agencies when actions taken under authority of the ESA and associated implementing regulations affect, or may affect, Indian lands, tribal trust resources, or the exercise of American Indian tribal rights. It acknowledges the trust responsibility and treaty obligations of the United States toward Indian tribes and tribal members. Accordingly, federal agencies will carry out their responsibilities under the ESA in a manner that harmonizes the federal trust responsibility to tribes, tribal sovereignty, and statutory missions and strive to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species.
Secretarial Order 3403 (2021): This Order (Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Water) seeks to protect the treaty, religious, subsistence, and cultural interests of federally recognized Indian Tribes. It directs federal agencies to ensure all decisions relating to federal stewardship of lands, waters, and wildlife under their jurisdiction consider the interests of any Indian Tribes and how to safeguard those interests.

3.24.4 Affected Environment

The analysis area is in the traditional subsistence range of the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes. Historically, their lifeways were shaped by seasonal travel and resource harvesting and gathering. They spent winter in the warmer lower areas along the river valleys, and summer and early fall higher in the mountains to take advantage of the cooler temperatures and to gather plants, harvest fish, and hunt small and large game animals (Forest Service 2015). The Nez Perce Tribe’s aboriginal territory and lifeways are associated with the Columbia Plateau, whereas the Shoshone-Bannock Tribes and Shoshone Paiute Tribes aboriginal territories and lifeways are associated with the Great Basin. The Columbia Plateau is characterized by arid tablelands, intermontane basins, dissected lava plains, and scattered low mountains (USGS 2016). The Great Basin is characterized by north-south trending mountain ranges with large basins between. A brief tribal history for each Tribe, beginning with the ethnohistoric period around the time of contact, and leading up to contemporary issues and interests is provided below. This information is summarized from publicly available sources. Although the Tribes each provided an ethnographic study, those documents contain confidential information and therefore are not disclosed to the public.

3.24.4.1 Nez Perce Tribe

Ancestors of the Nez Perce (Niimi’ipuu) were the aboriginal inhabitants of this region of Idaho. The Niimi’ipuu had one of the largest territories in present day Idaho, as their aboriginal territory covered parts of present-day north-central Idaho, northeast Oregon, southeast Washington, and western Montana. This area included several major river basins: the Columbia, the Salmon, the Snake, and the Clearwater (Indian Claims Commission 1961). The settlement and subsistence patterns of the Niimi’ipuu were varied and linked to resource distribution and environmental features (Churchill 1983). The Niimi’ipuu formed composite bands generally based on familial ties, language, and territory (ICCNAC 1992; Walker 1982). These bands lived in villages along the riverways and tributaries but traveled seasonally for subsistence. When travel was less frequent in the winter, the Niimi’ipuu lived in pit houses and longhouses. Teepees and wickups were used during more active traveling seasons such as spring and summer. Niimi’ipuu engaged in fishing, hunting, and gathering across their vast aboriginal territory, and these activities still play a major role in the culture, religion, subsistence, and commerce of The Nez Perce Tribe and their tribal members (Nez Perce 2017). Steelhead, several species of salmon, lamprey eels, and several other fish species were harvested for use and for drying as winter stores (Greiser Aff. 1998).

This lifeway was disrupted in the early to mid-1800s by Euroamerican fur-trapping, exploration, and settlement which occurred within Niimi’ipuu homelands and eventually the Nez Perce Tribe’s territory. Territorial governor Issac Stevens representing the U.S. government negotiated the Nez Perce Treaty of 1855 reserving land for the Nez Perce Tribe, centered in the Lapwai area of northern Idaho. Euroamerican miners and settlers continued to encroach on treaty reserved lands, and when gold was discovered in
Orofino, Idaho in the early 1860s, the problem intensified. Another treaty was drafted in 1863 claiming more Nez Perce territory for the U.S. government, which was ratified by the U.S. Congress in 1867. Much of the land claimed was in the Wallowa country of Oregon. This was the home of Chief Joseph’s band who had not been part of the 1863 treaty negotiations. A period of unrest and struggle between Chief Joseph’s band and the settlers followed, leading to the Nez Perce War in the 1870s. By 1877, most of Chief Joseph’s band was forced onto an Oklahoma reservation far from their homeland. A period of government control followed with the goal of assimilating Native Americans into the white population by suppressing native cultures and languages.

Despite this pressure to acculturate, the Nez Perce Tribe and \textit{Niimi’ipuu people} were determined to keep their culture and traditions. Additional laws were enacted that further reduced tribal lands, such as the Dawes Act of 1887 that allowed the government to divide communally held lands into individual parcels allowing each male tribal member an allotted number of acres. When the original allotment holder passed the land was divided among descendants. Any “leftover” land not allotted to a male tribal member was sold as surplus to Euroamerican farmers and cattle ranchers. The Dawes Act systematically fragmented tribal ownership of reservation lands and consumes Bureau of Indian Affairs resources for land ownership tracking. By the 1930s, this practice had debilitated tribal finances and caused the loss of millions of acres of treaty reserved lands and is an issue that continues to impact tribes (ICCNAC 1992; Nez Perce Tribe 2020a).

The Indian Reorganization Act of 1934 was passed to rehabilitate tribal economies and to further self-government. The act ended the issuance of further allotments and allowed the Secretary of the Interior authority to create new reservations for tribes with no previous federal land designation and to restore lands not already sold to tribal ownership. In 1935, The Nez Perce Tribe opted not to reorganize their government and constitution based on this Act. The Tribe, therefore, continued to be governed by its prior Constitution, which established a nine member Nez Perce Executive Council. The Constitution was amended in 1948 and again in 1961.

The elected Tribal Executive Committee remains the governing body of the Nez Perce Tribe. The goals of the Nez Perce Tribe today are to manage natural resources to meet the demands of modern society while providing cultural protection and economic stimulus (Nez Perce Tribe 2020a). The Nez Perce Tribe now manages a wide array of natural resources including timber and salmon fisheries within their 750,000-acre reservation, as well as within off-reservation treaty rights areas (Nez Perce Tribe 2020a).

Article 3 of the Nez Perce Tribe Treaty of 1855 affords the Tribe off-reservation rights for fishing in “all usual and accustomed places” and hunting, gathering, and pasturing livestock on open and unclaimed land outside the reservation. The analysis area is located within the area claimed to have been exclusively used and occupied by the Nez Perce Tribe, as adjudicated by the Indian Claims Commission (Indian Claims Commission 1961), and within the area in which the Tribe has asserted off-reservation treaty-reserved rights, such as taking fish in usual and accustomed places, hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land, pursuant to language of the Stevens Treaty.

In 1998, the United States filed federal reserved water rights claims as trustee for the Nez Perce Tribe. That filing attached an expert report documenting usual and accustomed fishing places reserved for the
Tribe by the 1855 Treaty. Based on these usual and accustomed fishing places, the United States asserted federal reserved water rights. Some of the usual and accustomed fishing rights identified by the United States were within the Operational Area Boundary (Greiser 1998).

Fishing, hunting, and gathering across the vast Nez Perce Tribe aboriginal territory and at their traditional places, including areas within and surrounding the SGP, and in waters directly downstream of the SGP, continues to be vital to the culture, religion, subsistence, and commerce of the Tribe (Nez Perce 2019). Anadromous fish, such as Chinook salmon; roots, such as camas; and a variety of game were, and continue to be, important subsistence resources (Hunn et al. 1998; Nez Perce Tribe 2019, 2020). Principal plant resources included camas, cous, wild onion, balsam root, and bitterroot. Noted tribal resources of concern include spring/summer Chinook salmon, steelhead, bull trout, westslope cutthroat trout, redband rainbow trout, mountain whitefish, western pearl shell, Rocky Mountain bighorn sheep, North American wolverine, fisher, gray wolf, Clark's nutcracker, whitebark pine, limber pine, bent-flower milkvetch, Sacajawea's bitterroot, and Idaho Douglasia. Some of their traditional-use resources of concern include huckleberries, serviceberry, elk thistle, yarrow, wild onion, wild tobacco, Indian hemp, tule, elderberry, chokecherry, Indian tea, Oregon grape, thimbleberry, alder, birch, kowskows, elk, mule deer, moose, and white-tailed deer. Further, the Nez Perce Tribe utilized Ponderosa Pine and Lodgepole Pine as a food resource (Churchill 1983). Through their ethnographic study, the Tribe has presented historical presence and continued use by tribal members in the analysis area.

The SGP is outside of the boundaries of the reservations recognized in either the Treaty of 1855 or the Treaty of 1863 reservations but is within the Nez Perce Tribe’s traditional use area and ceded lands. The Nez Perce Tribe continues to be active in fisheries management and habitat restoration along the Salmon River watershed (Nez Perce Tribe 2019). As the fisheries in their aboriginal territory are of such importance to their lifeway, the Nez Perce Tribe has a Department of Fisheries Resource Management (DFRM) that works to restore Chinook salmon in the East Fork SFSR and the SFSR watersheds. This program began in the early 1980s and includes hatchery supplementation, fishery research, and watershed restoration. Current activities in the analysis area include fish harvesting in the mainstem SFSR, as well as Secesh, Lick Creek, Johnson Creek, and EFSR. The Tribe’s ethnography identifies No Man’s Creek, Meadow Creek, and Sugar Creek as traditional fishing areas within the Operations Area Boundary. Other locations identified as traditional fishing areas in the tribal resources analysis area include: Secesh River, Buckhorn Creek, Camp Creek, Cougar Creek, Fourmile Creek, Blackmare Creek, Penney Creek and Springs, Dollar Creek, Six-bit Creek, Two-bit Creek, Trail Creek, Bear Creek, and Lodge Pole Creek (Battaglia 2018). Harvest activities in the SFSR focus on hatchery returns to an adult weir and trap located in the vicinity of Warm Lake (Nez Perce 2019).

3.24.4.2 Shoshone-Bannock Tribes

The Shoshone-Bannock Tribes of Fort Hall comprise the eastern and western bands of the Northern Shoshone and the Bannock or Northern Paiute bands who occupied a vast region that included most of southern Idaho, Oregon, western Wyoming and Montana, and areas south into Nevada and Utah (ICCNAC 1992; Murphy and Murphy 1986; Walker 1982). The Northern Paiutes left the Nevada and Utah regions for southern Idaho in the 1600s and traveled with the Shoshones in pursuit of buffalo; they became known as Bannocks (Shoshone-Bannock 2021). The northern portion of their territory in Idaho included present day Adams and Valley counties. The Shoshone-Bannock Tribes also traveled in and
collected resources throughout central Idaho’s Salmon River Mountains, among other areas (Forest Service 2003a; Murphy and Murphy 1986:286). The four Northern Shoshone Bands divisions included: (1) the Western Shoshone (Waareekas), including the Boise and the Bruneaus; (2) the Mountain Lemhi Shoshone, including the Dukudeka (Sheepeaters) and the Agaidikas (Salmoneaters); (3) the Northwestern Shoshone, including the Bear Lakes, Cache Valley, Bannock Creek and Weber Ute; and (4) the Pohogue (Fort Hall) Shoshone (Forest Service and BLM 1997).

The Shoshone (Newe) and the Bannock are two separate tribes with different languages, but these two groups formed into bands of shifting composition and leadership. The Shoshone speakers were the majority, but the chieftainship was sometimes held by a Bannock (Murphy and Murphy 1986). The two intermixed on hunting trips and eventually enough intermarriage occurred that the two Tribes became known as the Shoshone-Bannock Tribes. The Shoshone-Bannock Tribes traveled seasonally to collect plants and to hunt. Important animals and plants for subsistence included salmon, deer, elk, moose, mountain sheep, buffalo, various nuts, seeds, berries, and roots such as camas. Small game animals also were used extensively including groundhog, jack rabbit, porcupines, and prairie dogs (ICCNAC 1992; Walker 1982; Walker 2019). These resources are still important to the Shoshone-Bannock Tribes. Travel was by foot until horses were acquired in the early 1700s. With horses came increased mobility and hunting opportunities. The first contact with Euroamericans was with Lewis and Clark and their Corps of Discovery in the early 1800s which was aided by Lemhi Shoshone Sacajawea. Euroamerican and Shoshone-Bannock tensions significantly rose when Nathaniel Wyeth established the first trading post at Fort Hall, Idaho in 1834. As Fort Hall became a significant stopover for explorers, trappers, and settlers on their way to the west coast, thousands of Euroamericans traveled through the Shoshone-Bannock Tribes’ territory, causing loss of natural resources of critical importance to the Shoshone-Bannock Tribes (ICCNAC 1992). Fort Hall was later incorporated into the Fort Hall Indian Reservation ( SHALLAT 1995).

The U.S. government negotiated the Fort Bridger Treaty with the Eastern Band of Shoshoni [sic] and Bannocks in 1868, with the Tribes retaining the right to use all unoccupied land in the U.S. The U.S. government later consolidated the three Bannock bands and the Western Shoshone onto the Fort Hall Reservation. The Bannocks were promised their own reservation in the future, but that reservation was never established. The Bannock Tribe has contested the lack of their own reserved lands, which were promised in the 1868 treaty (Forest Service and BLM 1997; ICCNAC 1992).

In the northern part of the territory were the Mountain Lemhi Shoshone, who wintered along the Lemhi River, a tributary of the SFSR. The Lemhi depended heavily on salmon runs in the Salmon River system for their subsistence. Fish were harvested either individually by harpoon or utilizing weirs across stream channels, basket traps, or seines and hand nets (Murphy and Murphy 1986). The central Idaho and western Montana gold discoveries of the 1860s brought thousands of prospectors into Lemhi territory leading to increased resource competition, tribal displacement, rising tensions, and other hardships for the Lemhi, who were parties to an unratified treaty in 1868. The Lemhi Shoshone living on a small reservation, succumbed to U.S. government pressure in 1907 to move to the Fort Hall Reservation. The Dukudeka or the Mountain Shoshone lived in the mountains of central Idaho. Unlike the Lemhi and other Shoshone bands, this band did not acquire horses early on in the 1700s. Once the Dukudeka had horses, they joined with the Mountain Lemhi Shoshone (Forest Service and BLM 1997; Madsen 1999).
The Indian Reorganization Act of 1934 enabled the Shoshone-Bannock Tribes to establish a system of government operating under a constitution approved in 1936 (ICCNAC 1992; Shoshone-Bannock Tribes 2020). Today the Shoshone-Bannock Tribes are self-governed by the Fort Hall Business Council. This council consists of seven elected tribal members who serve two-year terms and maintain authority over all business procedures and matters of self-government. Today 97 percent of the 544,000 acres of lands on the Fort Hall Reservation are owned by the Shoshone-Bannock Tribes or by individual tribal members (Forest Service and BLM 1997; Shoshone-Bannock Tribes 2020a).

Article 4 of the Fort Bridger Treaty affords off-reservation rights to the Shoshone-Bannock Tribes on “unoccupied lands” of the United States. The Shoshone-Bannock Tribes exercise their off-reservation treaty rights by organizing hunting and fishing expeditions in “unoccupied lands” such as the analysis area and in adjoining western states beyond Idaho (State of Montana 2020). The Supreme Court has upheld tribal rights to hunt on unoccupied lands of the United States (Herrera vs. Wyoming 2019). The Shoshone-Bannock Tribes manage fish and wildlife populations, their habitats including watersheds such as the Salmon River basin through rehabilitation and hatchery programs that help reestablish fish runs decimated by mining, logging, forest fires, irrigation, and overgrazing (Polissar et al. 2016; Shoshone-Bannock Tribes 2020; Walker 1993).

The SGP lies outside of the Fort Hall Reservation but within the Shoshone-Bannock Tribes’ traditional use area. During tribal consultations, tribal members have conveyed the cultural significance of the analysis area for their people. Undeveloped portions of the Boise and Payette National Forests are considered unoccupied federal lands on which the Shoshone-Bannock Tribes exercise their tribal treaty rights. It is the Shoshone-Bannock Tribes’ philosophy that the protection and enhancement of their culture is directly tied to the exercising of tribal treaty rights, such as on and off reservation hunting and fishing, as it is through these activities traditional knowledge such as prayers, songs, stories, and practices are transmitted from generation to generation (Shoshone-Bannock 2015).

Landscapes and natural resources play an integral part in tribal spirituality, culture, and religious ceremonies. Items such as sweet sage and tobacco made from a variety of plants are used in ceremonies. The Shoshone-Bannock Tribes gather many plants for medicinal purposes, including chokecherry, sagebrush, and peppermint. A myriad of other plants are gathered for food and to provide shelter. Plants, rocks, clays, and other resources are also used for ceremonies, ornamentation, and shelter. The Shoshone and Bannock bands hunt and utilize buffalo, elk, deer, bighorn sheep, moose, upland game birds, and small mammals. Salmon fishing is an integral part of Shoshone-Bannock history and culture. Geysers, thermal pools, and other water features are also utilized heavily by the Shoshone-Bannock peoples (Probert 2004).

The Shoshone-Bannock have conveyed in their ethnography and during tribal consultations that the Thunder Mountain Road and the Burntlog Route are part of a travel route system used by the Tribes (Shoshone Bannock Tribes 2020). Historically, the Middle Fork of the Salmon River is a significant area and the tributaries of the East Fork SFSR were utilized for many activities and provided a communication network between the Weiser Band and the Lemhi.
3.24.4.3   **Shoshone-Paiute Tribes**

Ancestral bands of Western Shoshone and Northern Paiute traveled in small groups over a vast territory centered around southern Idaho, northern Nevada, and southeastern Oregon (Fowler and Liljeblad 1986; Thomas et al. 1986). The core subsistence areas of the Northern Paiute/Northern Shoshone-Bannock and the Western Shoshone were separated by the high ground dividing the Snake and Humboldt river drainages. Formerly each group travelled throughout different yet overlapping regions.

The Northern Paiute lived in two major bands in territories centering on the upper Snake and Owyhee Rivers, respectively. They used many of the same fishing and camas collection areas as the Shoshone-Bannock Tribes. The arid Paiute territory contained fewer subsistence resources than the Shoshone-Bannock Tribes’ territory, except in the river valleys (Walker 1982). They necessarily relied more on plant foods such as sunflowers, wada seeds, currants, and huckleberries, plus small animals and insects. These traditional resources are still important to the Shoshone-Paiute Tribes. Much time was spent pursuing food based on seasonal cycles. In May, they left winter villages to gather roots and prepare salmon traps. At the end of the salmon runs, people dispersed to hunt and gather plants and insects. Communal rabbit and antelope drives, and wada seed gathering occurred in early fall. By November, food had been stored and the people returned to the winter villages. Homes were typically conical frame structures with tule mat coverings, but domed earth covered such as pit house structures were used as well, along with temporary shelters in the summer such as tripodal framed structures or wikuups and caves (Walker 1982, 2019).

The Western Shoshone were composed of various bands who traveled in small groups over a vast territory centered around southern Idaho and northern Nevada following seasonal routes to procure food. The bands were often named for their principal foods. Camps were shared, and bulkier items would be left in the camps or winter villages for communal use. Both the Western Shoshone and the Paiute were somewhat isolated by the Rocky Mountains and the Great Basin and did not encounter Euroamericans in their territory until the 1820s, but by the 1840s Euroamericans were traversing Shoshone and Paiute territory to reach the California gold mines. At first relationships were amicable, but conflicts ensued as use of the California Trail increased and the Shoshone-Paiute Tribes’ lands were depleted of traditional animal and plant resources (ICCNAC 1992; Shoshone-Paiute Tribes 2020). Travelers using the California Trail urged Congress to provide protection, and the U.S. government responded by sending agents to make treaties with the Shoshone, the Paiute, the Bannock, the Ute, and the Goshute. However, this did not solve the conflict, because the first treaty in 1855 was not ratified by Congress and was never recognized. Frustrated and lacking needed resources, the Western Shoshone and the Paiute fought back, and the U.S. government established military forts at Fort Halleck, Fort Ruby Valley, and Fort McDermitt. In 1863, the Western Shoshone signed the Treaty of Ruby Valley but did not cede lands to the U.S. government as part of this peace treaty.

The creation and subsequent expansions of the Duck Valley Indian Reservation relocated bands of Northern Paiute, Northern Shoshone, and Bannock people. In 1877, the Duck Valley Reservation was set aside by EO for several Western Shoshone bands who traditionally lived along the Owyhee River of southeastern Oregon, in southwestern Idaho, and along the Humboldt River in northeastern Nevada. At that time, Shoshone leader Captain Sam said this location was ideal as it was plentiful with game and fish, there was good farmland, and abundant timber (Shoshone-Paiute Tribes 2010). Later, they were joined by
Paiute from the lower Weiser country of Idaho and independent Northern Paiutes from Fort McDermitt, Camp Harney, and Quinn River and from the Owyhee region of southwestern Idaho, who settled on the reservation and took up farming and ranching. The reservation was expanded on the north side by another EO in 1886 to include a Northern Paiute group, Paddy Cap’s Band, who arrived in 1884 after being released from the Yakama Reservation (Forest Service and BLM 1997). A third expansion occurred in 1910 (Shoshone-Paiute Tribes 2020). The Shoshone and Paiute united at Duck Valley under the Indian Reorganization Act of 1934 and formed a tribal government through a constitution and bylaws which was adopted in 1936 (Shoshone-Paiute 2021).

Today, the Duck Valley Reservation encompasses approximately 294,000 acres. A lack of water on the reservation was an issue for farming, and the need for a dam and reservoir was recognized as early as the 1880s. Requests were ignored by the federal government for many years, and construction of a dam and reservoir (Wildhorse Reservoir) was not completed until 1937 as part of the Duck Valley Irrigation Project. The Shoshone-Paiute Tribes are governed by a Tribal Business Council made up of seven elected tribal members who serve three-year terms (Forest Service and BLM 1997; Shoshone-Paiute Tribes 2020). The SGP lies outside of the Duck Valley Reservation but within the Shoshone-Paiute Tribe’s traditional use area.

Various ratified and unratified treaties were made with ancestral bands of the Duck Valley Reservation, which have led to currently unresolved land claims and off-reservation rights (McDonald 2009). Many Shoshone-Paiute tribal members today have ancestors in more than one aboriginal group and many are multilingual (Forest Service 2003b). Individuals therefore maintain interests in the territories of more than one group. Management of resources, such as water, fish, and wildlife, are of importance to the Shoshone-Paiute Tribes (Harrison 2015; Shoshone-Paiute Tribes 2020).

3.24.4.4 Tribal Interests

The existing conditions in the context of Native Americans refers to the reserved rights tribes have in the analysis area and how these rights are being exercised. Each of the federally recognized tribes with interests in the analysis area bring their own language, traditions, and religion to the area. Since time immemorial, access to and availability of natural resources has been crucial to the survival of indigenous communities, and these resources still have a major role in subsistence, culture, religion, and economy of the tribes. Many places were visited during a yearly cycle of seasonal migrations to collect food, medicines, and other materials for sustenance, as well as for religious practices and social gatherings.

The gathering of these resources is still a significant part of the individual cultures of the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes. Tribes maintain an active role in the protection and restoration of various species of plants, wildlife, and fish and their habitats. In NFS lands of Idaho, resource use of forest products is tied to personal, traditional, economic, and spiritual purposes, including fishing, particularly for anadromous fish, hunting big game, gathering plants for consumption and for basketry, as well as roots, berries, and harvesting wood products for teepee poles, firewood, and sweat lodges (Forest Service 2003b).

Ethnographic studies undertaken by individual Tribes for the SGP (Nez Perce Tribe [Battaglia 2018]; Shoshone-Bannock Tribes [Lahren 2020]; Shoshone-Paiute Tribes [Walker 2019]), public scoping...
comments and documents, comments on the DEIS, and government-to-government consultation between the Forest Service and Tribes have identified existing conditions and tribal concerns in the analysis area.

Many fish, wildlife and plant species were and are traditionally utilized by regional tribes and bands of this region for subsistence, ceremonial, medicinal, and other uses (Battaglia 2018; Hunn et al. 1998; Lahren 2020; Walker 2019). Culturally important species of fish, wildlife, and plants are present in the analysis area, and the Forest Service is continuing to consult with the Tribes about these tribal resources of concern. In regard to federal trust responsibilities and resources of concern, known resources of interest to the Tribes are presented in the following sections.

**Tribal Historical/Archaeological Sites**

A number of historical and archaeological sites that may have importance to Tribes have been identified within the SGP analysis area. For purposes of the Section 106 consultation and to provide a framework within which to identify potential heritage resources of importance, two APEs were developed for the SGP; a physical effects APE which generally constitutes those areas where ground disturbing activity may occur and a visual, auditory, and vibratory APE which comprises a broader area in which non-physical, or indirect effects may occur. These APEs are wholly contained within the tribal analysis area.

Project-specific heritage resource inventories have been conducted in the APE for physical disturbances to identify historical and archaeological sites. Additional previously recorded heritage resource data was gathered from the Idaho SHPO to identify historic properties within both the physical APE and the visual, auditory, and vibratory APE. This information is presented in detail in Section 3.17. In summary, 36 heritage sites with archaeological components have been identified within the APEs and thus the tribal analysis area. Of this total, 15 are located within the physical APE for the SGP and the remainder are located within the visual, auditory, and vibratory APE.

**Sacred Sites or Places, Traditional Cultural Properties, Cultural Landscapes**

Consideration for non-archaeological tribal resources including sacred sites or places, TCPs, and CLs, is also a component of review during the NEPA process and is the responsibility of the lead federal agency when evaluating an undertaking. The Forest Service is consulting with the Tribes regarding potential sacred sites or places in the analysis area.

A TCP, as defined in the NHPA, is a property that is eligible for inclusion on the NRHP “because of its association with cultural practices or beliefs of a living community that are rooted in that community’s history and are important in maintaining the continuing cultural identity of the community” (Parker and King 1994). Stated another way, a significant TCP is defined as a property with “significance derived from the role the property plays in a community’s historically rooted beliefs, customs, and practices” (Parker and King 1994).

The National Park Service (NPS) defines a CL as a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values. CLs are generally one of four types: vernacular, designed, historic site, or ethnographic (NPS 2021). Ethnographic studies have been completed for the SGP by the Nez Perce Tribe (Battaglia 2018), the Shoshone-Paiute Tribes (Walker 2019), and the
Shoshone-Bannock Tribes (Lahren 2020) to assist in identifying TCPs and CLs, as defined by the NPS. The Forest Service is in ongoing consultation with Tribes regarding potential TCPs and CLs in the analysis area.

Landscape features noted in the Nez Perce Tribe’s ethnography (Battaglia 2018) as having specific significance include: viewsheds and soundscapes, water and waterways, minerals, culturally modified trees, hot springs, trails, and travel corridors. The Nez Perce Tribe’s ethnography identifies TCPs located within the analysis area (Battaglia 2018). The Payette National Forest is consulting with the Tribe to document and evaluate a TCP District for its eligibility to be listed on the NRHP.

The South Fork Salmon River and broader area is described in the Shoshone-Bannock Tribes’ ethnography (Lahren 2020) as a CL that supports the hunting of salmon, gathering food, collecting berries, harvesting medicinal plants, and hunting big and small game, among other cultural practices. The Payette National Forest is consulting with the Tribes to identify TCPs or CLs in the analysis area and to document properties and determine their eligibility for listing on the NRHP.

Landscape features noted in the Shoshone Paiute Tribes’ ethnography (Walker 2019) as having specific significance include: buttes; rock features and rock alignments; springs and hot springs; trails and travel routes; river and stream canyons; rock structures; valleys; caves and rock shelters. The Payette National Forest is consulting with the Tribes to identify TCPs or CLs in the analysis area and to document properties and determine their eligibility for listing on the NRHP.

**Traditional Use Sites**

In addition to the tribal use and management of fish, wildlife, and plant resources, there are areas throughout the PNF and the BNF that have traditional, cultural, and spiritual significance to the Tribes (Battaglia 2018; Walker 2019; Lahren 2020). Usual and accustomed fishing places have been documented throughout the area (Greiser Aff. 1998). The use and protection of these areas by the Tribes is a way of maintaining the link between their continuing culture and their ancestors. Areas with more than one type of significance to the Tribes often include locations such as hot springs, waterfalls, trails, rock art panels, and traditional gathering areas; it has been identified that the interconnectedness of these resources across the landscape is important. Other landscape features of importance include high points, such as mountain tops and ridgelines that have religious significance and are used for spiritual practices. Archaeological findings, information gathered during tribal consultations, and ethnographic studies from the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes convey and identify that traditional use sites are located in the analysis area, although exact locations are not public information (Battaglia 2018; Lahren 2020; Walker 2019).

Tribally significant travel corridors and waterways have been identified in the analysis area including portions of the historic Old Thunder Mountain Road route (FR 440), portions of the historic Burnt Log Road route (FR 414), the East Fork SFSR watershed and its tributaries, and the Riordan Lake shore. Traditional plant gathering and natural mineral site locations or collection areas within the analysis area also were cited as important to the Nez Perce Tribe in the ethnography, but exact locations of these gathering areas have not been shared.
Named places of importance to the Nez Perce Tribe as identified in the ethnography (Battaglia 2018) include: East Fork SFSR and Stibnite Mine; Johnson Creek; Yellow Pine, Idaho; Riordan Lake; Middle Fork of the Salmon River; South Fork of the Salmon River; Buckhorn Creek; Camp Creek; Cougar Creek; Fourmile Creek; Blackmare Creek; Penny Springs/Creek; Dollar Creek; Six-bit Creek; Two-bit Creek; Trail Creek; Bear Creek; Lodge Pole Creek; Poverty Flats; Phoebe Creek; Profile Creek; Caton Creek; Reagan Creek; Parks Creek; No Man’s Creek; Stibnite Creek/Meadow Creek; Salt Creek; Pepper Creek; Sugar Creek and Cane Creek; Lemhi Creek; Tamarack Creek; Warm Lake; Elk Meadow; and Long Valley.

Places of importance identified in the Shoshone-Bannock Tribes’ ethnography (Lahren 2020) include: South Fork Salmon River; Bear Creek; Blackmare Creek; Buckhorn Creek; North Fork Buckhorn Creek; East Fork SFSR; Johnson Creek; Burntlog Creek; Riordan Creek; Sand Creek; Trapper Creek; Profile Creek; Elk Creek; West Elk Creek; Fitsum Creek; and North Fork-Fitsum Creek.

Places of importance identified in the Shoshone-Paiute Tribes’ ethnography (Walker 2019) include: South Fork Salmon River; Middle Fork of the Salmon River; Bear Creek; Blackmare Creek; Buckhorn Creek; North Fork of Buckhorn Creek; East Fork SFSR; Profile Creek; Johnson Creek; Burntlog Creek; Riordan Creek; Sand Creek; and Trapper Creek.

**Land Status and Access**

Much of the SGP is on NFS land administered by the PNF and BNF and is mostly unoccupied federal lands; therefore, most lands are available for treaty rights use as stated in the various treaties and executive orders. usual and accustomed fishing places are also available. There are tribal concerns regarding the loss of unoccupied federal land which diminishes the area available to exercise treaty rights as well as loss of access to usual and accustomed fishing places.

The SGP Operations Area Boundary is composed of lands administered by the Forest Service and private lands; it includes both patented and unpatented mining claims. The SGP Operations Area Boundary currently contains over 850 acres of previous mining disturbance in the form of open pits, tailings, and development rock storage facilities. Some restoration and remediation activities have taken place, but extensive disturbance remains. Long-term mine operations have been the dominant land use within the Operations Area Boundary.

The transportation network in the analysis area includes State Highway (SH) 55, Valley County roads, and NFS roads. Valley County maintains Warm Lake (CR 10-579), Johnson Creek (CR 10-413), and McCall-Stibnite (CR 50-412) roads on NFS lands through easements. Additional details regarding access and the transportation system are provided in **Section 3.16**.

Public access through the SGP area is currently allowed and used for dispersed recreation and access to surrounding areas for recreation. The Burntlog Route would include the existing 20 miles of Burnt Log Road, which currently does not extend into the SGP area. The Johnson Creek Route would include the Johnson Creek Road and the Stibnite portion of the McCall-Stibnite Road. There are tribal concerns about continued access to usual and accustomed places in which Tribes exercise their rights. Currently, there are no tribal access restrictions on the Forest Service lands in the SFSR watershed. Tribes access their usual
and accustomed fishing places, hunting areas, and plant gathering areas consistent with their reserved rights.

**Water Resources**

The analysis area includes lands in the East Fork SFSR watershed. These waters support fisheries in area streams and rivers. A detailed discussion of water resources is located in Section 3.9. The 1863 Treaty with the Nez Perce Tribe reserved the use of springs and fountains as well as perpetual rights-of-way to and from them. The definition of fountain is “a spring or source of water; the source or head of a stream”\(^1\). Tribal concerns include access to treaty resources including water. Further, impacts to water quality and or quantity affect wildlife, fisheries, and plants, and therefore treaty resources.

The Greiser Affidavit (1998) identifies streams with usual and accustomed fishing places in a region that includes the analysis area. In the vicinity of the Operations Area Boundary and disturbance associated with access roads under the 2021 MMP and Johnson Creek Route Alternative, the following identifications were made:

- Johnson Creek was identified as a usual and accustomed fishing place. The identification in upstream portions of Johnson Creek was based on archeological, ethnographic, and historical references while the portions of Johnson Creek near its confluence with the East Fork SFSR were based on identification by Nez Perce elders.
- Sugar Creek was identified as a usual and accustomed fishing place based on identification by elders.
- Intermittent reaches of the East Fork SFSR in the Operations Area Boundary, above the confluence with Sugar Creek were identified as usual and accustomed fishing places based on identification by elders.
- Other tributaries to the East Fork SFSR in the Operations Area Boundary were not identified as usual and accustomed fishing places (e.g., Meadow Creek, Blowout Creek, Rabbit Creek, Garnet Creek, Fiddle Creek, Midnight Creek, Hennessy Creek, West End Creek).
- There are more than 100 seeps and springs in the Operations Area Boundary that are not contiguous with the creek locations. These springs were not identified as usual and accustomed fishing locations. These locations are shown in Figure 3.8-6.

**Wetlands**

Numerous wetland resources were identified in the Operations Area Boundary and adjacent areas throughout the analysis area, as described in Section 3.11. Wetlands provide important ecological functions for associated streams and rivers. Related riparian areas not only shade stream corridors and improve water quality, but they also provide migratory corridors for wildlife and important habitat for terrestrial and avian wildlife. Tribal concerns include impacts to wetland and riparian areas are impacts to fisheries, wildlife, and vegetation habitat and therefore treaty resources.

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**Fisheries**

Culturally important fish species in the analysis area include Chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), Pacific lamprey (*Lampetra tridentata*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*) and western pearlshell mussel (*Unionida*) (Battaglia 2018; Walker 2019).

Tribal salmon harvest areas include the mainstem SFSR, Secesh River, Lick Creek, Johnson Creek, and the East Fork SFSR and other tributaries with traditional fishing locations (Battaglia 2018; Nez Perce Tribe 2019). The Nez Perce Tribe expends millions of dollars annually restoring Chinook salmon runs in the East Fork SFSR and the SFSR through hatchery supplementation, fishery research, and watershed restoration. Imperiled stocks of spring/summer Chinook salmon, steelhead, and bull trout, and designated Critical Habitat including the upper East Fork SFSR up to the Yellow Pine pit lake at Stibnite, are of particular interest (Nez Perce Tribe 2019). The Tribes’ concerns regarding fisheries extend to their restoration efforts being disrupted by the SGP and associated activities, including reduced access to perform fishery restoration.

Further, the Shoshone-Bannock Tribes, in conjunction with federal agencies, have developed fishery and wildlife projects that are being implemented within the Salmon and Upper Snake River sub-basins, including a conservation hatchery and satellite facility to expand chinook salmon and steelhead supplementation projects, among others (Shoshone-Bannock Tribes 2020b). The Salmon River Habitat Enhancement Project’s goal is to monitor Chinook salmon and steelhead populations and evaluate their response to habitat actions in the Salmon River Basin (Shoshone-Bannock Tribes and FCRPS Action Agencies 2008). Specific information regarding fisheries is presented in Section 3.12.

Tribal concerns include salmon runs, salmon habitat, and tribal subsistence. The Tribes are concerned that the SGP would undo their fisheries restoration efforts and further jeopardize fish populations. Concerns include the loss of traditional fishing grounds and loss of harvest amounts.

**Vegetation**

Whitebark pine is currently federally proposed as a threatened species. Approximately 2,069 acres of occupied whitebark pine habitat were identified within the analysis area for vegetation resources. Limber pine habitat has also been documented as it is often coterminous with the whitebark pine habitat; both species thrive at high elevations and in harsh conditions. Mature limber pine trees are uncommon in the surrounding Forests, and this may be the only documented population of this species on the PNF (Forest Service 2022g). Lodgepole pine and subalpine fir are common in the vegetation analysis area.

There is one known occurrence of sweetgrass, a Forest Service sensitive species, located along the Burntlog Route, as well as one known occurrence of bitterroot, also a Forest Service sensitive species, located in the transmission line corridor. Sweetgrass rarely occurs on the Boise and Payette National Forests. Both sweetgrass and bitterroot area traditional and culturally significant plants for the Plateau and Great Basin tribes.

Plants and trees not only provide food but are utilized for shelters, baskets, and firewood. Teepees and sweat lodges are constructed from lodgepole pines. Tribal concerns include that traditionally gathered plant species documented in the SGP and surrounding area would be negatively impacted by the SGP including reduced ecosystem and plant community health or loss of habitat to treaty resources.

**Noxious Weeds and Invasive Species**

There is Tribal concern about non-native vegetation replacing native vegetation. Noxious weeds and non-native plant species have been documented in the SGP area and surrounding area in Valley County, Idaho. Noxious weeds and non-native plants are commonly found along roads and in other areas disturbed by soil movement or vegetation clearing. Detailed information on noxious weeds and invasive species in found in Section 3.10.

**Wildlife**

Detailed information regarding wildlife resources can be found in Section 3.13. Culturally important wildlife species in the analysis area include bighorn sheep (*Ovis canadensis*), North American wolverine (*Gulo gulo*), gray wolf (*Canus lupus*), elk or wapiti (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), black bear (*Ursus americanus*), coyote (*Canis latrans*), and a wide array of raptors, owls, waterfowl, upland game birds, small mammals, invertebrates, and other species (Battaglia 2018; Walker 2019). Tribal restoration efforts have included improving suitable habitat for bighorn sheep and gray wolf populations (Nez Perce Tribe 2019).

Bighorn sheep occupy rugged canyons, foothills, and mountainous terrain in the analysis area. Wolverines have been documented in the PNF and BNF in general and the analysis area. The Shoshone-Paiute Tribes during tribal consultations have conveyed the specific cultural significance of wolverines. Gray wolves are habitat generalists with large pack territories; their range is related to availability of prey species, including deer, elk, and, less commonly, moose, bighorn sheep, and domestic stock. Gray wolves are also well documented in the analysis area including in the FCRNRW. Mule deer have been observed frequently in and near the analysis area.
Tribal concerns include direct impacts to wildlife populations and habitat loss as a result of the proposed SGP activities and there are indirect impact concerns regarding increased public access to currently “inaccessible” areas which could affect wildlife and other tribal resources, as well as impact solitude.

**Treaty Rights Access**

The Tribal interpretation of “access” to exercise treaty rights goes beyond the concept of simple entry into an area by vehicle or foot. “Access” also includes continued availability of the traditional natural resources in an area. Therefore, the tribal interpretation of loss of access extends to the exclusion, limitation, or unavailability of the traditional resources due to mining disturbance, associated infrastructure, and road construction. It would also presumably apply to the displacement of wildlife in those areas.

The Tribes are concerned with fish, wildlife, and plant populations’ health, retaining access on federal lands, continued availability of resources of concern, and access to their usual and accustomed fishing areas in order to exercise Tribal treaty rights. The Tribes assert their authority and responsibility to advocate for species and habitat health as well as preserving their treaty rights for future use of lands and resources to ensure future opportunity.

**Noise**

Ambient noise levels in the analysis area are generally low. Rural communities or unpopulated lands are generally quiet but noise can be sporadically elevated by activities such as road traffic, air traffic, gunshots from hunting, or blasting from mining or avalanche control. Noise levels in the analysis area are highest in the urban areas (i.e., Cascade) adjacent to major transportation routes (i.e., SH 55). Along transmission lines, noise can include corona noise in the sound form of crackling or hissing. Additional details about noise and ambient noise levels around components of the SGP is presented in Section 3.6. Tribal concerns regarding noise include noise health stressors affecting wildlife as well as noise impacts to tribal experiences in traditional use areas.

**Visual Resources**

The analysis area is characterized as a mountain landscape broken occasionally by wide valleys with flat or hilly floors below mountain crests. In most instances, the valleys are narrow, rugged gorges. Tall, dense evergreen trees create a dark green visually dominant color throughout the area. Light grey rock outcroppings and boulder fields are scattered throughout the landscape at higher elevations. Historical mining and human development are discernable and have impacted visual resources in the analysis area.

Human development is noticeable throughout the analysis area including roads, trails, fences, utility lines, and airstrips. Other structures include cabins, residences, barns, and outbuildings. Historic mining disturbances, such as access roads, historic mining pits, waste rock disposal areas, heap leach pads, and a spent ore disposal area, are present at the SGP. The East Fork SFSR flows through the mine site and forms a human-made lake at the bottom of the existing Yellow Pine pit with riparian vegetation along some areas of the pit wall. Additional details about visual resources in the analysis area is presented in Section 3.20. Tribal concerns include visual impacts as a result of the SGP proposed actions that would impact tribal experiences in traditional use areas.
Recreation

Summertime recreation opportunities such as hunting, fishing, hiking, paddle boating, camping, and horseback riding are popular throughout the analysis area with opportunities available at developed facilities, such as campgrounds and trails, and at dispersed locations, such as dispersed camping areas and specially designated areas including inventoried roadless areas, the nearby FCRNRW, and suitable Wild and Scenic Rivers. Warm Lake is a destination for water-related recreation, such as boating and swimming. Backpacking and pack trips are popular in the Big Creek area and from trailheads into the FCRNRW. Fishing opportunities are available throughout the analysis area, particularly at Johnson Creek, Warm Lake, SFSR, and East Fork SFSR, for species such as salmon, steelhead, whitefish, and trout. There are numerous trails open to motorized use including in inventoried roadless areas. Snowmobiling is popular in the winter with groomed over-snow routes branching off plowed main roads. Additional details about recreation opportunities and facilities are presented in Section 3.19.

Tribal hunting, fishing, pasturing, and gathering rights, reserved by the respective treaties and executive orders, need no state regulations or permits to be exercised by tribal members. Federal agencies recognize that the Tribes regulate their own tribal members for hunting and fishing. Tribal members are not required to secure state hunting or fishing permits within Forest Service lands.

Air Quality

Specific data regarding air resources is located in Section 3.3. All lands within the air quality analysis area have been designated Class II for National Ambient Air Quality Standards (NAAQS). The air quality in the vicinity of the SGP is good to excellent because of its remote location, and relatively limited industrial activity in the area. Air quality is designated as in attainment for all NAAQS and Idaho Ambient Air Quality Standards.

Tribal concerns in relation to air quality include environmental and human health issues caused by air pollution, as well as concerns that air pollution reduces visibility which can impair cultural and ceremonial practices and reduce enjoyment of traditional use sites and special places.

Socioeconomics

Baseline information regarding socioeconomics is presented in Section 3.21. There is limited available published information on use of the analysis area by tribal members. A 2015 economic study (Peterson 2015) reported the impacts of five Tribes on Idaho’s economy, including the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes. The study notes that the Nez Perce Tribe’s Fisheries Restoration Program is the largest in the U.S. (Peterson 2015). However, the report contains few other details relevant to the analysis area. The Nez Perce Tribe’s DRFM operates Fisheries Restoration Programs in the vicinity of the SGP such as the Johnson Creek Artificial Propagation Enhancement Project and its associated research program. Annual funding for the project and research is approximately $1.5 million from a total annual operating budget of $22 million and utilizes DRFM’s staff labor from the total group of 200 employees (Nez Perce Tribe 2020a). The project produces up to 110,000 Chinook salmon smolts annually for direct release into Johnson Creek while the research program examines smolt-to-adult return rates and the utilization of hatchery rearing of wild fish to supplement fish populations.
There are additional tribal fisheries restoration efforts that include translocation of adult Chinook salmon from the SFSR to Meadow Creek. Spawning-ready adult Chinook salmon are periodically translocated from the SFSR to upstream of the Yellow Pine pit lake barrier with support from the Nez Perce Tribe.

Traditional tribal land use occurs throughout the analysis area. The Tribes’ concerns include direct and indirect socioeconomic impacts from the loss of treaty-reserved rights as well as the losses resulting from the inability to engage in on-going fishery restoration activities in the area and restricted or denied harvest opportunities.

**Environmental Justice**

Environmental justice is considered to determine whether any disproportionately high and adverse human health or environmental effects to low-income, racial minority, and tribal populations may occur as a result of a federal action, in accordance with EO 12898. All three tribal reservations meet the definition of an environmental justice minority community based on their American Indian population and total minority population, which are meaningfully greater than Idaho’s statewide averages (Table 3.24-1). They also represent a community with environmental justice concerns because the percentage of their residents with annual incomes below the federal poverty level is meaningfully greater than Idaho’s statewide average (Table 3.24-1).

<table>
<thead>
<tr>
<th>Geography</th>
<th>American Indian and Alaska Native</th>
<th>Total Minority¹</th>
<th>Below Federal Poverty Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Idaho</td>
<td>1.1%</td>
<td>18.0%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Nez Perce CCD², Nez Perce County, Idaho</td>
<td>35.2%</td>
<td>48.4%</td>
<td>19.8%</td>
</tr>
<tr>
<td>Duck Valley Reservation³</td>
<td>83.9%</td>
<td>93.2%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Fort Hall Reservation³</td>
<td>58.4%</td>
<td>73.4%</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

Source: Census 2017 (most recent data for Nez Perce CCD, Duck Valley Reservation, Fort Hall Reservation), Census 2019 (State of Idaho)

¹ Total minority equals total population minus the Non-Hispanic White population.

² CCD = Census County Subdivision – A county subdivision delineated cooperatively by the Census and local government authorities.

³ Census identified American Indian Reservation areas and populations.

EO 12898 directs federal agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife. Communities of color, low-income communities, tribes, and other indigenous peoples depend on healthy aquatic ecosystems and the fish, aquatic plants, and wildlife that these systems support to a greater extent and in different ways than does the general population (National Environmental Justice Advisory Committee [NEJAC] 2002). These resources are important not only for subsistence but are vital for cultural, traditional, or religious reasons (NEJAC 2002). Contamination or depletion of streams, rivers, and associated resources can impact these groups’ subsistence, economic, cultural, traditional, and religious practices. Details of the affected environment for wildlife and fish can be found in **Section 3.13 and 3.12**, respectively. Tribal harvest activities occur along the mainstem SFSR, Secesh River, Lick Creek, Johnson Creek, and the East Fork SFSR (Nez Perce Tribe 2019). There are
tribal concerns that the wildlife and fisheries impacts would disproportionately affect the Tribes compared to the general population.

**Traditional Land Uses and Features**

Tribal lifeways are intrinsically place-based. Watersheds, rivers, tributaries, plant-community and mineral gathering areas, and campsites have been described in the Tribes’ ethnographic studies (Battaglia 2018; Lahren 2020; Walker 2019). The ethnographies identify some point specific “traditional use sites” and during tribal consultations only a few specific sites have been identified. This is due mostly to privacy issues. It is known that the NFS lands were, and are, used for traditional subsistence practices such as hunting, fishing, and gathering and for traditional activities such as ceremonies and religious practices. To protect the privacy of the Tribes, these activities are discussed and analyzed in general terms.

Traditional activities are still practiced today across the Forests and central Idaho. Fish harvest occurs in the SFSR and its tributaries, including the Secesh River, Johnson Creek, and the East Fork SFSR. Within the Operations Area Boundary portions of the East Fork SFSR and Sugar Creek have been identified as usual and accustomed fishing places (Greiser 1998). Nez Perce Tribe harvest activities in the SFSR focus on hatchery returns to an adult weir and trap located in the vicinity of Warm Lake (Nez Perce 2017). Other tributaries in the SFSR and East Fork SFSR watersheds have been identified as usual and accustomed fishing areas. Many tribal members hunt, fish, and gather plants for subsistence and medicine, in addition to collecting algae, minerals, driftwood, and other Forest resources to maintain their traditional way of life, customs, and culture (Battaglia 2018; Lahren 2020; Walker 2019).

Traditional campsites have been identified in the ethnographic studies; these sites are often utilized for subsistence purposes and are located in the analysis area. These campsites often contain historic material culture or artifacts and are often recorded by Forest archaeologists as historic properties eligible for listing on the NRHP. Place names in Sahaptin or Numic languages are often associated with these types of sites along with other traditional locations, watershed, travel routes, and features on the landscape (Battaglia 2018; Lahren 2020; Walker 2019).

Culturally significant topographical features are not limited to, but include ridges, prominent points, and summits, such as Thunderbolt Mountain (8,658 feet amsl), Thunder Mountain (8,530 feet amsl) and the Meadow Creek Lookout area (8,830 feet amsl), where one can see the vast expanse of the landscape, including the rivers, creeks, and mountains. Undisturbed viewsheds and soundscapes are a critical component for tribal members’ religious experiences that occur in these landscapes. Other notable features identified in the ethnographies include rock features and structures and springs and hot springs (Battaglia 2018; Lahren 2020; Walker 2019).

The Tribes use the Salmon River and its tributaries for travel and sustenance. Prior to Euro-American contact, the Tribes utilized specific travel routes or trails through the area. Some of these traditional travel routes were later used by Euro-Americans and became part of the network of trails between historic mining districts and boom towns. Some of these trails have become a part of the Forest Service trail system, while others have been further developed into roads, such as the Old Thunder Mountain Road (FR 440) which is also a historic tribal travel corridor that intersects with parts of the Burnt Log Road (FR 414) (Battaglia 2018; Lahren 2020; Walker 2019).
3.24.4.5 Consultation to Date

The government-to-government relationship between federal agencies and federally-recognized tribes is a special relationship based on Tribal Sovereignty. The Forest Service is conducting government-to-government consultation regarding the SGP with the following federally-recognized tribes: the Nez Perce Tribe; Shoshone-Bannock Tribes; and the Shoshone-Paiute Tribes. This consultation process was initiated with the Tribes through a notification letter from the Forest Service offering opportunities to participate in formal government-to-government consultation, to participate in the NEPA process as a cooperating agency, to participate in the NHPA Section 106 programmatic agreement process, and/or to routinely receive information about the SGP.

The intergovernmental consultation process serves as the primary means for the federal agencies to carry out their trust responsibilities/obligations. Consultation is not a single event, but instead is an informed process leading to a decision. Although consultation is a formal legal process, consultation means different things to different tribes. It can be either a formal process of negotiation, cooperation, and policy-level decision-making between tribal governments and the federal government, or a more informal process. Tribal rights, ideas, and interests are discussed and considered or incorporated into the decision. Tribal consultation is an on-going relationship between agencies and Tribes, characterized by consensus-seeking approaches to reach mutual understanding and resolve issues. It may concern issues and actions that could affect the government’s decision-making processes, or other tribal interests.

Consultation minimally serves five purposes:

- To identify and clarify issues;
- To provide for an exchange of existing information and identify where information is needed;
- To identify and serve as a process for conflict resolution;
- To provide an opportunity to discuss and explain the decision; and
- To fulfill the core of the federal trust obligation.

Because Native American tribes can be affected by the policies and actions of the Forest Service in managing the lands and resources under its jurisdiction, the Forest Service has a duty to consult with them on matters affecting their interests. Because of this government-to-government relationship, efforts were made to involve local tribal governments and to solicit their input regarding the SGP.

The Forest Service first notified Nez Perce Tribe cultural resource staff about the SGP on March 1, 2017. Formal consultation with the Nez Perce Tribe was requested and initiated on May 23, 2017. The Nez Perce Tribe formalized opposition to the SGP in a resolution passed by the Nez Perce Tribal Executive Committee (the governing body of the Tribe) on October 9, 2018 and announced opposition in a press release the same day. Despite formal opposition to the SGP, the Tribe continues to participate in the project-specific informal consultation process, including discussion on ways to avoid, reduce, or mitigate impacts.

The Forest Service introduced the SGP to Shoshone-Paiute Tribes tribal leadership during the Wings and Roots Program meeting (government-to-government consultation) on April 13, 2017.
The SGP was formally presented to the Shoshone-Bannock Tribes Fort Hall Business Council and also informally to tribal staff on July 26, 2017.

Cultural studies also referred to as ethnographies were conducted by the Tribes to aid identification of historic properties, sacred sites or places, TCPs, and CLs in the analysis area and potentially to mitigate impacts to historic properties, sacred sites or places, TCPs, CLs, and other cultural resources of tribal interest (Battaglia 2018; Lahren 2020; Walker 2019).

Updates are provided to each of these Tribes in an ongoing basis during project-specific ad hoc staff to staff consultation meetings; and the Forest Service will continue to engage in government-to-government consultation throughout the NEPA process.

The structure of formal government-to-government consultation is between tribal governing bodies (Executive Committee, Tribal Councils, Tribal Chairperson, traditional Chiefs, or those identified formally by a Tribe’s governing body as ‘representative’ of that Tribe’s interests) and Forest Service Line Officers. Staff-to-staff meetings usually include Forest Service technical specialists, tribal liaisons, and technical specialists.

The Shoshone-Paiute Tribes do not conduct informal consultation; however, they have professionally moderated meetings between the Tribal Business Council Chair and the Forest Service Line Officers, with other members of the Council and/or tribal staff occasionally attending as well.

USACE has been represented in an informal capacity in one or more project-specific Forest Service consultation meetings with each of the Tribes, to offer information on the Clean Water Act Section 404 permitting process.

The Nez Perce Tribe, Shoshone-Paiute Tribes, and Shoshone-Bannock Tribes were invited on April 30, 2020, to participate in development of a project-specific programmatic agreement (PA) and associated historic properties treatment plan and historic properties management plan, which are being prepared to mitigate potential impacts to heritage resources and address compliance with Section 106 of the NHPA.

In January 2022, the Nez Perce Tribe and the Shoshone-Paiute Tribes held respective government-to-government meetings with the Forest Service to discuss the tribal interests analysis area, areas of potential effect for the Section 106 of the NHPA, the PA process, the project timeline, and current status.

There have been ongoing staff to staff and government to government meetings between the Forest Service and the Tribes. A table summarizing consultation and coordination efforts from the beginning of the NEPA process, including communications associated with Section 106 of the NHPA, is provided in Appendix A of the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q).
4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Chapter 4 describes the potential environmental consequences of implementing each of the alternatives presented in Chapter 2. Pursuant to 40 CFR 1500.1(b) and 1500.4, this section summarizes the completed analysis and forms the scientific and analytical basis for the comparison of alternatives. The alternatives described in Chapter 2 may cause, either directly or indirectly, changes in the human and natural environment. This EIS analyzes these potential changes and discloses the effects to the decision-makers and the public. Disclosure is a fundamental goal of NEPA. In addition, applicable mitigation measures and irreversible and irretrievable effects also are discussed. Effects of each action can be neutral, beneficial, and/or adverse. Effects are quantified whenever possible, and/or are qualitatively discussed.

The individual resource discussions are generally presented by issue(s) and organized with the presentation of the effects analysis issues and indicators for the resource; a brief methodology for the analysis of impacts; an evaluation of the alternatives’ impacts to the resource; irreversible and irretrievable commitments, and short-term uses versus long-term productivity. A table summarizing and comparing these quantitative and qualitative impacts to each resource by alternative is located in Section 2.8.

4.1.1 Effects Analysis Indicators and Methodology of Analysis

An issue is defined as a point of concern, disagreement, debate, or dispute with a proposed activity based on some anticipated effect. Issues are described in terms of cause and effect; that is, if an action occurs, an impact could result. Issues are addressed by describing comparative factors that provide a way to define, compare, and contrast the effects of the alternatives, including the No Action.

An indicator is an element or parameter used to determine change (and the intensity of change) in a resource (e.g., acres of wetlands disturbed). These issues and indicators are used to predict or detect change in a resource related to causal effects of the alternatives in Chapter 4 (i.e., environmental consequences).

In addition, the analysis procedures and assumptions used to develop the current conditions and environmental consequences are summarized in this section. Unless specifically stated otherwise, additional supporting information, including detailed analysis procedures and assumptions for each resource area, can be found in the SGP record.

The modeling, analysis, and unit amounts for indicators such as acreage and road miles are all best estimates based on the latest available information. The modeling and analysis conducted for this SDEIS are intended to indicate relative differences among the alternatives, rather than to predict absolute amounts of activities, outputs, or effects.
4.1.2 Impact Assessment

The terms “effect” and “impact” are synonymous under NEPA. Effects may refer to physical, biological, economic, social, or health-related phenomena that may be caused by any of the alternatives. Effects may be direct, indirect, or cumulative in nature.

The word “significant” has a very particular meaning when used in a NEPA document. Significance is defined by CEQ as a measure of the intensity and context of the effects of a major federal action on, or the importance of that action to, the human environment. Significance is a function of the beneficial and adverse effects of an action on the environment. Impacts in this EIS are described as to their intensity, duration, and context as defined in Table 4.1-1.

Intensity refers to the severity or level of magnitude of an impact which can vary from barely perceptible up to large, measurable changes that result in major modification of an evaluated resource. Public health and safety, proximity to sensitive areas, level of controversy, unique risks, or potentially precedent-setting effects are all factors to be considered in determining intensity of effect.

Duration refers to the length of time an impact would occur ranging from a temporary duration through short-term, long-term, and permanent impacts.

Context means that the impacts of an action must be analyzed within a framework, or within physical or conceptual limits. Impacts can be limited within the localized area of the proposed action and action alternatives, or they can extend beyond these boundaries to a more regional nature.

Table 4.1-1 Impact Definitions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>Negligible</td>
<td>Impacts would result in a change in current conditions that would be too small to be physically measured using normal methods or would not be perceptible. There is no noticeable effect on the natural or baseline setting. There are no required changes in management or utilization of the resource.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Minor</td>
<td>Impacts would result in a change in current conditions that would be just measurable with normal methods or barely perceptible. The change may affect individuals of a population or a small portion of a resource, but it would not result in a modification in the overall population, or the value or productivity of the resource. There are no required changes in management or utilization of the resource.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Moderate</td>
<td>Impacts would result in an easily measurable change in current conditions that is readily noticeable. The change affects a large percentage of a population, or portion of a resource which may lead to modification or loss in viability, value, or productivity in the overall population or resource. There are some required changes in management or utilization of the resource.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Major</td>
<td>Impacts are considered significant. Impacts would result in a large, measurable change in current conditions that is easily recognized. The change affects a majority of a resource or individuals of a population, which leads to significant modification in the overall population, or the value or productivity of the resource. This impact may not be in compliance with applicable regulatory standards or impact thresholds, requiring large changes in management or utilization of the resource.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Duration</td>
<td>Temporary</td>
<td>Impacts that are anticipated to last no longer than 1 year.</td>
</tr>
<tr>
<td>Duration</td>
<td>Short-Term</td>
<td>Impacts that are anticipated to begin and end within the first 3 years during the construction phase.</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-Term</td>
<td>Impacts lasting beyond 3 years to the end of mine operations and through reclamation, approximately 20 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>Impacts that would remain after reclamation is completed.</td>
</tr>
<tr>
<td>Context</td>
<td>Localized</td>
<td>Impacts would occur within the analysis area or the general vicinity of the Operations Area Boundary.</td>
</tr>
<tr>
<td>Context</td>
<td>Regional</td>
<td>Impacts would extend beyond the Operations Area Boundary and local area boundaries.</td>
</tr>
</tbody>
</table>

*Intensity* is the severity or levels of magnitude of an impact.  
*Duration* is the length of time an effect would occur.  
*Context* is the effect(s) of an action that must be analyzed within a framework, or within physical or conceptual limits.

A direct effect occurs at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by an action that occur later in time or are removed in distance but are still reasonably likely. Indirect impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8). Direct and indirect effects are discussed in combination under each resource.

### 4.1.3 Mitigation for Impacts

Prominent regulatory and Forest Plan requirements listed in Table 2.4-12 have been included in conducting the impact analyses in the following sections of this chapter. Proponent proposed design features listed in Table 2.4-13 have also been considered in the analyses.

In addition to the above requirements and design features and where applicable, mitigation measures are proposed in this document. Mitigation measures are a means to address environmental impacts that are identified in the impact analysis to reduce intensity or eliminate the impacts. To be adequate and effective, CEQ regulations (40 CFR 1508.20) require that mitigation measures fit into one of five categories: Avoiding the impact altogether by not taking a certain action or parts of an action; Minimizing impacts by limiting the degree or magnitude of the action and its implementation; Rectifying the impact by repairing, rehabilitating, or restoring the affected environment; Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or Compensating for the impact by replacing or providing substitute resources or environments.

If residual or unavoidable impacts remain after mitigation is applied, those impacts are also described within the following sections.

### 4.1.4 Irreversible and Irretrievable Commitments of Public Resources

The CEQ regulations require an evaluation of “any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented” (40 CFR 1502.16). A discussion of this topic is included in each of the following resource evaluations.
A commitment of a resource is irreversible when the resource is used up, permanently limited, or impacted by an action such that it would return to its previous condition only after a long-time span.

A commitment of a resource is irretrievable where a resource, or its use, is lost for period of time but would be restored in the reasonably near future. Use of the resource may be foregone for the period of the action, during which the resource cannot be used, but the resource can be restored to an acceptable condition after the action.

4.1.5 Short-term Uses versus Long-term Productivity

The CEQ regulations require an evaluation of environmental sustainability considering the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). Each resource section provides a brief discussion of the short-term effects of the SGP versus the maintenance and enhancement of potential long-term productivity of each resource in its analysis area.

4.1.6 Forest Plan Consistency and Potential Amendments

The Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a) provide guidance for the management of lands and activities within each respective National Forest. The Forest Plans accomplish this by establishing desired conditions, goals, objectives, standards, and guidelines. Desired conditions, goals, and objectives are applicable on a forest-wide basis. Standards and guidelines are either applicable on a forest-wide basis or by specific management areas.

A review of all standards in the Forest Plans within forest-wide and specific management areas was conducted to identify aspects of the Forest Plans where the proposed activities of the SGP were found to be inconsistent with relevant standards and for which amendments are proposed. The purpose of the amendments is to ensure consistency between the SGP and the Forest Plans. For additional details on the project-specific amendments and their specific rationale, see Appendix A Forest Plan Consistency and Land and Resource Management Plan Amendments.

4.2 Geologic Resources and Geotechnical Hazards

4.2.1 Impact Definitions and Effects Indicators and Methodology

The analysis of effects to geologic resources and geotechnical hazards includes the following issues and indicators:

Issue: The minerals present at the site are economically valuable and may contribute to the national goal of being economically independent in strategic metals, such as antimony.

Indicators:

- Amount of ore extracted
- Depletion of mineral resources
**Issue:** Mining activities could change the existing topography and leave physical hazards if not properly designed and managed.

**Indicators:**

- Alteration of natural topography
- Unstable slopes

**Issue:** Geological and geotechnical stability of the SGP facilities, including the TSF and other mine components.

**Indicators:**

- Geological/Geotechnical suitability of the selected locations for the mining and facilities to be constructed.
- Long-term geologic/geotechnical stability of the proposed structures.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

### 4.2.2 Direct and Indirect Effects

The following analysis of effects associated with geologic resources and geotechnical hazards is considered within the overall context of the local and regional geology. Elements of this context include:

- A majority of the analysis area is on NFS lands within the Salmon River Mountains, a high-relief mountainous physiographic province of central Idaho with the presence of steep slopes that are subject to landslides and avalanches.
- The analysis area is comprised of relatively common types of rocks to the region and common landforms (e.g., glacial and fluvial geomorphic features, asymmetric hill slopes).
- The area lacks protected or managed geologic resources, such as cave and karst formations, and contains rock units that generally preclude preservation of fossils.
- The analysis area is within a seismically active region and it is anticipated to be subjected to earthquake ground shaking (URS 2013, Golder 2021).
- The mine site includes disturbed areas as a result of previous mining activities, resulting in the presence of legacy mine features with associated slope stability and seismic stability considerations.
- The ore of interest (i.e., gold-, silver-, and antimony-bearing material) is economically valuable and/or of strategic importance.

### 4.2.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua, and geologic and mineral resources would continue to be impacted by past mining activities and by currently permitted Perpetua exploration activities.
Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015c). These approved activities include construction of several temporary roads (approximately 0.32 mile) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the Operations Area Boundary. The continuation of approved exploration activities at the SGP by Perpetua would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip. Consequently, there would be little change in the current status of geologic and mineral resource conditions at the Operations Area Boundary other than natural erosive and weathering processes.

Past mining activities have resulted in long-term impacts to the pre-existing geologic and mineral resources by nature of the previous underground and surface mining of these resources. Legacy impacts from these activities include the existing mining disturbances such as underground openings, surface disposal of development rock, spent heap leach materials, and open pits. On-site processing of these ores has resulted in legacy tailings deposits. These mining wastes have resulted in documented environmental impacts to topography, soils, vegetation, groundwater, surface water, and biota. These legacy conditions have been compounded by forest fires over the past several decades. Under the No Action Alternative, these existing impacts would remain largely as they are today and are expected to continue to have long-term localized impacts.

In January 2021, Perpetua (then Midas Gold) entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of contaminated sediment, mine wastes, and tailings from within and along the banks of Lower Meadow Creek and the East Fork SFSR. It also includes construction of three stream diversions to prevent clean water from infiltrating source areas, and a study of selected adit discharges. The primary objective of these removal actions is to eliminate or reduce potential ecological and human exposure to metals by mitigating sources of contamination from contact with sediment and surface water. Following these construction activities, the disturbed areas would be reclaimed with growth medium and revegetated to stabilize the sites. This work is planned to occur between 2022 and 2024. These activities are expected to have long-term, localized beneficial impacts.

4.2.2.2 2021 MMP

Mining methods proposed in the 2021 MMP would include open pit mining and re-processing legacy tailings. In addition, the 2021 MMP includes limited underground exploration and sampling to be accessed via the Scout exploration decline. The legacy tailings are in the Meadow Creek valley. Open pit mining methods would be implemented for three known mineral deposits: Yellow Pine, Hangar Flats, and West End.

The legacy tailings, which were deposited in the Meadow Creek valley bottom without a liner system, are currently under the spent heap leach ore disposal area but within the planned footprint of the proposed TSF Buttress. The spent heap leach ore would be removed and reused for construction purposes as appropriate. The legacy tailings would then be removed and reprocessed. All of the new tailings from the
proposed milling operations would be deposited in a modern TSF and would be fully lined with a geosynthetic liner system.

Although there would be temporal overlap in the mine development and operations, the general sequence of mining would be the Yellow Pine deposit and legacy tailings reprocessing first, Hangar Flats deposit second, and the West End deposit third. This mining sequence would include backfilling the Yellow Pine pit with West End development rock to reclaim the approximate original gradient of the East Fork SFSR, to provide permanent fish passage, and facilitate aquatic habitat enhancement.

Mining of the three mineral deposits would be conducted using conventional open pit surface mining techniques with a series of benches from which development rock and ore would be extracted using standard mining equipment including blast-hole drills, shovels, loaders, and off-highway trucks.

**Mineral Resources**

Geologic studies by Perpetua have reported approximately 132.3 million tons of measured and indicated ore resource (including historical tailings) for the SGP property with another 36.2 million tons of inferred ore (Table 1-2, M3 2021). This represents the in-place mineral resources before application of modifying factors to determine the estimated economically mineable portion (aka "reserves") of the mineral resources based on application of technical, economic, social, and government factors which tend to increase operating costs and therefore reduce the amount of mineral resource that can be economically mined. The 2021 consolidated mineral reserve summary for the SGP indicated total probable and proven mineral ore reserves of 104.625 million tons, including historical tailings (M3 2021).

Under the 2021 MMP, approximately 280 million tons of development rock and 112 million tons of ore would be mined. About 3.2 million tons of historical Bradley tailings "ore" would also be removed and reprocessed. Total ore processed would be 115.2 million tons.

The contained metal content in the 2021 proven and probable mineral reserve of the property is approximately 4.819 million ounces of gold, 6.431 million ounces of silver, and 148.686 million pounds of antimony (Table 1-4, M3 2021). From the total ore currently planned to be mined the SGP is estimated to recover, over 15 years of mill production, 4.238 million ounces of gold, 1.710 million ounces of silver, and 115.342 million pounds of antimony (M3 2021).

According to the 2021 USGS Minerals Commodity Summaries (USGS 2021b), no marketable antimony was produced by U.S. mines in 2020. The apparent domestic consumption of elemental antimony in 2020 was 22,000 metric tons with an estimated value of $193 million. The main uses of antimony in the U.S. are for flame retardants, metal products, and non-metal products including ceramics, glass, and rubber. Recycling (largely at secondary lead smelters processing spent lead-acid batteries) supplied about 18 percent of the estimated consumption and the rest was imported. Imported antimony metal and oxide came mostly from China, Belgium, Thailand, and India. The SGP would change the domestic mine production of antimony in the U.S. from the current zero production to 52,319 metric tons of contained antimony over the life of the mine, which is roughly 2.4 times the U.S. antimony consumption in 2020. Unless and until a significant domestic smelting capacity to treat this concentrate was available, this mineral material would be exported for smelting and then the antimony products could be imported to the U.S. for use.
In May 2021, Perpetua Resources signed a collaboration agreement with U.S. Antimony Corporation, Thompson Falls, Montana, to explore the feasibility for U.S. Antimony processing the stibnite concentrate produced at the SGP. U.S. Antimony owns an antimony smelting facility and has experience producing various antimony products as well as precious metals from mineral concentrates provided by others. In its public statements, U.S. Antimony has expressed confidence that it can develop the processing technique to handle the SGP antimony concentrate.

In August 2021, Perpetua entered into an agreement with Ambri Inc., a U.S. company to provide antimony to support commercialization of Ambri's liquid metal battery technology.

In 2020 the apparent U.S. silver consumption was approximately 8,000 metric tons for electronics, jewelry and silverware, coins and medals, photography, and others such as pharmaceuticals, solar cells, water purification, dental amalgam, biocides etc. (USGS 2021b). A metric ton of silver is equivalent to 32,150.7 troy ounces. Approximately 6,500 metric tons of that silver consumed was imported, mostly from Mexico, Canada, Peru, and Poland. Silver production from the SGP over the life of the mine would be about 53.19 metric tons which is less than one percent of the 2020 U.S. consumption rate.

In 2020, the U.S. exported approximately 270 metric tons of gold and consumed approximately 160 metric tons of gold, mostly for jewelry, electronics, coins, and other (USGS 2021b). A metric ton of gold is equivalent to 32,150.7 troy ounces. Gold is a mineral commodity where the U.S. is a net exporter and the domestic gold production in 2020 was valued at about $11 billion (USGS 2021b). Gold production from the SGP property over the LOM would be about 131.82 metric tons which is just over 82 percent of the 2020 U.S. gold consumption.

Mining is planned to provide approximately 7.68 million tons of ore to the mill feed annually over 15 years and produce about 20 million tons of development rock per year through Mine Year 12 of the operations (including 2 years of pre-stripping). Mining would be phased to produce mill feed only from the Yellow Pine pit and historic tailings until Mine Year 5 of operations after which Yellow Pine ore delivery would ramp down and be completed in Mine Year 7. Hangar Flat ore would be added to the production in Mine Year 4 and be completed in Mine Year 7. West End ore delivery would begin in Mine Year 7 and continue until Mine Year 12.

Long-term ore stockpiling would be practiced early in the operations to optimize process ore feed value through the mine life, improve overall utilization of the mineral resources, and other operational improvements. Stockpiled ore would be blended with direct ore feed from the pits beginning in Mine Year 2 of the operations and continue until the end of mill operations in Mine Year 15. Stockpiled ore exclusively would be fed to the mill in the last 3 years of mill operations.

Ore stockpiling would be particularly helpful during the first half of the operations when higher-value Yellow Pine ore would be mined at a higher rate than the process plant capacity. This stockpiling of early, higher-grade ore production from the Yellow Pine pit would increase utilization of the mineral resource.

Gold and silver occurs in all three deposits within arsenical pyrite and arsenopyrite and some free gold in oxidized portions of the West End pit. High antimony sulfide ore would be treated by standard flotation methods to extract a stibnite concentrate and then a gold/silver sulfide concentrate. The antimony
concentrate would be shipped offsite for further processing. Low antimony sulfide ore would be treated by flotation to only produce a gold/silver concentrate and not an antimony concentrate. High-antimony ore makes up about 30 percent of the ore in the Yellow Pine deposit and 54 percent of the ore in the Hangar Flats deposit; there is no high antimony ore in the Bradley tailings or West End deposit (2021 MMP).

On-site processing of antimony concentrate has been investigated by Perpetua including caustic leaching and electrowinning. While testing indicated it was possible to design and build an antimony processing circuit, the risk of not being able to economically and consistently produce marketable products was deemed too high to include this in the SGP.

Some gold and significant amounts of silver would also be contained in the stibnite concentrate. The gold and silver values in the precious metals sulfide concentrate are poorly recoverable by direct cyanide leaching so this concentrate would be pressure oxidized to make it amenable to leaching in a standard cyanidation circuit. Pressure oxidation of the gold/silver concentrate is intended to better utilize the mineral values in the concentrate. Some oxide ore, largely encountered in the West End pit, would be leached directly without producing a flotation concentrate.

The proposed mining plans would highly utilize the economically minable mineral resources. The proposed processing plant would extract a high proportion of the contained target metal values from the ore feed. The projected mining and processing of the described proven and probable mineral reserves would constitute a major and permanent reduction of the measured and indicated mineral resources that have been identified at the SGP. This is by design to fully utilize the economically minable mineral resources. These impacts would be localized to the specific open pit areas.

**Topography**

Mining under the 2021 MMP would result in expanded open pits at the Yellow Pine and West End deposits and a new open pit at the Hangar Flats deposit. Each of these pits would result in highwalls developed in rock that would permanently remain after mining. These highwalls are geotechnically designed to be stable and would be permanent features imposed on the topography of the site. Each of these pits would also be backfilled with development rock to a certain degree which would bury certain portions of the open pits and their highwalls. Other major changes to local topography would include the proposed TSF and the TSF Buttress. Smaller changes to topography would occur due to engineered cuts and fills at constructed haul roads, processing facilities, and ancillary facilities. The Burntlog Route access road would also be constructed with engineered cuts and fills that would change the topography along its route.

Pit design parameters were based on economics and geotechnical characteristics of the rock. Overall pit slope designs were based on geotechnical studies to develop an understanding of the physical characteristics of the material to be mined and design overall slopes that would be stable (STRATA 2014b). The inner slopes, or highwalls, of each pit would include step-like catch benches at regular spacings up the highwalls. The highwalls would be developed with final bench heights of 40 feet, bench widths of 20 feet and inter-bench faces angled at 63 degrees from vertical in rock and 45 degrees in alluvium. Overall highwall heights and slope angles are described below for each pit.
Yellow Pine Pit

The Yellow Pine pit would be approximately 222 acres in plan extent and 720 feet deep to a bottom elevation of 5,360 feet (Figure 2.4-2). It would be roughly circular in plan with a lobe extending into the Homestake area to the northeast and another lobe in the south end of the pit. The western highwall would extend to a height of about 600 feet above the approximate pit backfill top elevation and the eastern highwall would extend to a height of about 900 feet above the pit. The overall pit slope angle would vary from about 39 degrees on the east and northeast pit walls to about 47 degrees on the west highwall (M3 2021). The pit would be backfilled with development rock, largely produced in the West End pit, up to the elevation of the valley floor which would permanently bury the highwalls below this elevation leaving the east and west highwalls permanently extending above the pit backfill. Remaining pit highwalls at the Yellow Pine open pit would be permanent and constitute major impacts on the localized topography.

Hangar Flats Pit

The Hangar Flats pit would have a plan area of 66 acres with a central pit bottom elevation of 6,080 feet which would be about 460 feet deep (Figure 2.4-2). The pit haul road would exit the pit in a ramp extending to the northeast in the valley bottom from the pit. The northwest highwall of the pit would extend about 800 feet up the valley side above the proposed pit backfill. The pitwalls in rock would have an overall slope of 44 degrees and 36 degrees in alluvium (M3 2021). The pit would be backfilled with development rock, largely produced in the West End pit, up to the elevation of the valley floor which would permanently bury the highwalls below this elevation and permanently leave the northwest highwall extending above the pit backfill. The remaining pit highwall at the Hangar Flats open pit would be a permanent and major impact on the localized topography of the site.

West End Pit

The West End pit would have a plan area of 185 acres with a complex interior that would include the limestone quarry area, the main pit, the Midnight area, and the southwest end (Figure 2.4-2). It would have a bottom elevation of about 6,180 feet, which would be about 440 feet deep. This pit would not be backfilled and the remaining highwalls would be about 1,000 feet high. The overall pit slopes would largely be 45 to 47 degrees (Fig. 15-4, M3 2021). The remaining pit highwall at the West End open pit would be a permanent and major impact on the localized topography of the site.

Tailings Storage Facility and TSF Buttress

The TSF would contain, at final capacity, about 120 million tons of tailings solids. This TSF would disturb approximately 423 acres and be contained behind an embankment with 2h:1v side slopes that would be constructed in phases using a downstream construction method (Figures 2.4-10 and 2.4-11). The ultimate height of the embankment would be about 475 feet above native ground and it would have a crest width of 135 feet. The outer face of the embankment would be backfilled with development rock contained in the TSF buttress. This buttress would be constructed at the same time as the embankment itself and would variably extend downslope of the ultimate embankment profile 1,000 to 2,000 feet. It would eventually contain 81 million tons of development rock. The final outer slopes of the buttress upon mine closure would be 3h:1v. The TSF and TSF Buttress would be permanent, major impacts on the local topography of upper Meadow Creek valley.
Burntlog Route

To maintain grades of less than 10 percent and provide a road width of 26 feet, including shoulders, the existing topography along the route would be modified with cuts and fills of various lengths and heights. Topographic lows along the newly constructed roadway would be crossed with earth fills incorporating culverts and bridges to pass drainages under the roadway.

During final reclamation, the 23 miles of existing and widened roads would be returned to their previous widths by scarifying and regrading. The 15 miles of newly constructed road would be reclaimed by pulling back fills and re-contouring roadcuts consistent with surrounding topography as practicable. The regraded areas would be revegetated.

The cuts and fills of the Burntlog access route would be long-term and moderate to major impacts to local topography during operations. When the route is reclaimed, the topographic impacts would be reduced to minor to moderate and permanent local impacts.

Other Facilities

The other 2021 MMP facilities would require localized grading to build level sites for the facilities. These would include the maintenance and processing facilities at the mine site, the SGLF, Burntlog Maintenance Facility, Stibnite Worker Housing Facility, and multiple smaller facilities. Each of these sites would be balanced cuts and fills with cut and fill slopes designed to be stable.

Detailed geotechnical data or assessment of existing mass wasting hazards has not been generated for off-site facility components of the SGP. However, it is expected that geotechnical issues arising from these components would generally be minor compared to the mine site and their construction would follow standard engineering practices that address and prevent geotechnical failures.

The final reclaimed slopes for these cuts and fills are described in the Reclamation and Closure Plan (Tetra Tech 2021a) and summarized in Section 2.4.7. Most fill slopes would be regraded to approximate original contour or 3h:1v gradients and many of the cuts would be backfilled to various degrees. These final slopes are intended to be stable in the long term and able to be reclaimed with vegetation to reduce erosion.

The cuts/fills of the other facilities of the SGP would be localized, moderate, long-term impacts to topography when constructed. The outer slopes of these other cut/fills would generally be reclaimed to approximate 3h:1v gradients that would be revegetated and over time would tend to blend in with the surrounding topography. These reclaimed disturbances would permanent, moderate impacts to the local topography of those sites.

The SGLF has a post-mining land use designation of light industry, where it would remain un-reclaimed after mine operations and transferred to a third-party for light industrial uses.

Utilities

Construction of the proposed electric power transmission line would involve upgrading approximately 63 miles of existing transmission line and upgrading five existing substations. For this portion of the
transmission line, improvement to the existing access roads and structure sites may be required but would be expected to result in negligible impacts to topography.

About 6.3 miles of transmission line would be rerouted to new alignments; a new substation would be built (Johnson Creek substation); and a new 9-mile-long transmission line segment would be built from the Johnson Creek substation to the SGP mine site. During construction, the new section of transmission line between the Johnson Creek substation and SGP would require major improvements to Horse Heaven Road (FR 416W), NFST 233 (no name), and approximately four miles of new spur roads would be constructed. Minor upgrades to Cabin Creek Road (FR 50467) would also be required. This construction would involve building cuts and fills as needed with the intent to minimize grading to what is necessary for construction. Surficial geology would be affected in localized areas within the expanded utility easements for pole replacement, grading, or footings as needed. Similarly, surficial geology and landforms would be directly impacted during utility upgrades. Impacts would be localized to areas where new utility infrastructure (or upgrades) are needed and negligible.

The disturbed areas would be revegetated following construction which would mute the appearance of the topographic impacts.

During final reclamation, the transmission line right-of-way from Johnson Creek substation to the mine site, and spur roads used to access power pole structure sites, would be removed, recontoured to match surrounding topography, and revegetated. The topographic impacts to construct the transmission line would be localized, minor, and long term. After reclamation, these impacts would be minor and permanent.

**Geotechnical Stability**

Certain proposed SGP facilities would have exposure to potential geotechnical impacts from existing landslides, rockfalls, and avalanche paths. SGP facilities to be located in the vicinity of these hazards would include designs and operational procedures to reduce risk to workers and operations.

Geotechnical stability of the proposed SGP facilities would be ensured by application of state-of-the-art practices for design, construction, and operation of the facilities. Studies have been conducted to characterize the geologic conditions of the foundation areas of these facilities and these characteristics have been incorporated into the designs of the facilities.

The designs of major earth fills such as the TSF and TSF Buttress have incorporated slope stability analyses including the potential effects of earthquakes. Impacts from earthquakes on other SGP facilities would be minimized by incorporation of existing geotechnical design standards and building code standards, as well as construction quality control, operations and maintenance, and surveillance.

**Landslides and Rockfalls**

Landslides and rockfalls have been identified within the SGP mine operations area and along the Burntlog Route (Figure 3.2-6). Known landslides and rockfalls are not anticipated to cause adverse effects on mine operations (STRATA 2014a). These natural features could be destabilized to various degrees by proposed construction disturbances. The geographic extent of effects would be localized, within the immediate vicinity of these rockfall and landslide features. Each of these potential hazards would be addressed in the
final designs of the various SGP components and site-specific, geotechnical design features would be installed to avoid or control these natural hazards. Impacts caused by landslides and rockfalls during construction and operations would be localized and are expected to be short-term and moderate.

The Meadow Creek valley site is surrounded by mountain topography that would be above the TSF. There are identified rockfalls above the Meadow Creek valley site (STRATA 2014a) that could impact the integrity of the liner during initial construction, but these risks can be mitigated with engineering controls (e.g., berms, rock nets, rock-fall berms). Although several mass wasting features have been identified in the vicinity of proposed mine support facilities and infrastructure (Figure 3.2-5), the proposed facility sites would be located on satisfactory foundation material (STRATA 2014a).

There is an ancient (glacial-age) landslide upslope of the proposed worker housing facility, about 1.3 miles upstream from the East Fork SFSR confluence with Meadow Creek (Figure 3.2-5). These glacial-age landslides are associated with groundwater seeps on steep slopes and may experience creep during wet periods (STRATA 2014a). Construction of the worker housing facility is not expected to exacerbate existing landslide hazards, provided the toe of the existing landslide is not disturbed during construction.

Widening of existing access roads and construction of new segments of the Burntlog Route would increase the size of existing cut-slopes, exposing bedrock upslope of the road corridor. Exposed bedrock could become more susceptible to mechanical weathering such as ice heave and wedging, which could dislodge fragments of bedrock into road corridors. The Riordan Creek Valley segment of the Burntlog Route crosses areas of active landslides. Application of appropriate engineering design features would be incorporated into all road construction and foundation planning for the SGP, which is intended to minimize the effects of frost heave and wedging of rock road cuts.

Rock fall occurs from rock fragments released from steep, rocky overhangs and creates debris on the roadways in steep sections of the access routes. This is particularly notable along sections of Stibnite Road, and there is potential for rockfall on the Black Lake and Riordan Creek Valley segments of the Burntlog Route. Rock falls are caused by diurnal freeze/thaw cycles more prevalent of spring weather conditions. Potential impacts from rock falls include roadway blockage and/or damage, and there is also a significant human health and safety concern due to the potential to strike vehicles if they are in the path of falling rocks.

EDFs such as rock bolts, netting, and signage would be installed along segments susceptible to rock falls. Responsibility for removal of rock debris from the roadways would be detailed in the maintenance agreement with Valley County.

Perpetua would employ appropriate design features and construction considerations to minimize the effects of landslides and rockfalls including:

- Avoid known occurrences of slope failures to the degree practicable.
- Incorporate appropriate cut slopes and stabilizing features (e.g., retaining walls, soil nails) into road design to reduce the potential for slope failure.
- Road layback design to prevent the formation of steep overhangs and prevent spalling.
- Consider rock bolts, netting and catch benches in areas subject to rockfalls.
A Maintenance Agreement between Perpetua Resources and Valley County would be developed defining the procedure and protocols for removing material debris from the access route.
- Slope dewatering or other stabilizing structural features as control measures.
- Where necessary, realign the roadway.

Most of the effects within the immediate vicinity of the existing rockfalls and landslide features would be localized, temporary, and minor. Although there is a low probability of localized, moderate, and long-term effects where rockfalls and landslides create regular maintenance responses during the life of the operations.

Avalanches

Several areas of the Operations Area Boundary are within avalanche hazard zones based on information from DAC (2018) (Section 3.2.4.7). Avalanche hazards are already present in the analysis area. Avalanche occurrence is largely a result of a combination of three factors: weather, snowpack, and terrain. The SGP would not substantially alter these factors, but components of the SGP in the paths of avalanches could be impacted. The most significant concern for avalanche impacts to the 2021 MMP would be along the access routes where avalanches could directly impact vehicles and personnel who were in the path of the avalanches when they occurred (Figure 3.2-6). Such accidents could harm the involved persons, damage impacted vehicles, or even potentially cause the vehicles to upend or leave the road. The later situations could then lead to secondary environmental effects from spills of fuel, coolant, or cargoes.

A more likely impact would be cases where an avalanche deposited snow and forest debris on the affected roadway which would then require response by plows or other equipment to clear the road and reopen access to the Operations Area Boundary. The effects of these cases would depend on the relative size of the avalanche, described by DAC (2021) in the project areas as potentially size D1 through D4. Size D1 and D2 avalanches would involve displacement of 10 to 100 tonnes of snow respectively, would be more common than larger avalanches, and could cause an accident or stop traffic until the road was cleared. However, even these smaller avalanches could present a severe safety hazard to persons on foot in the avalanche paths. Less likely, but larger D3 avalanches would displace 1,000 tonnes and could bury or destroy a car and damage a truck. The largest potential avalanche path found by DAC (2021) in the analysis area are size D4 avalanches which would displace 10,000 tonnes of snow and have the potential to destroy even large trucks as well as a substantial amount of forest.

Avalanche hazard areas also are present in proximity to the proposed mine support facilities and infrastructure (Figure 3.2-5). These existing avalanche hazards would be addressed in the siting and design of proposed facilities at the mine site, but the increased number of personnel present at the mine facilities, and increased value of facilities and equipment at the mine as a result of the 2021 MMP would increase the potential risk of damage, injury, and loss of life from the existing avalanche hazards. Blasting associated with mine operations could trigger avalanches in the vicinity of the mine operations.

Mears and Wilber Engineering (2013) evaluated the avalanche hazard around the TSF and the TSF Buttress. The assessment identified areas of high, moderate, and low risk of avalanche activity. The assessment indicates that both the TSF and TSF Buttress areas have a risk of being impacted by
avalanches. Associated impacts from avalanches would be expected to be contained within these areas and are not expected to cause additional impacts. The risks posed by avalanches in these areas would be higher during construction when more work activities might be present.

Along the Burntlog Route, the potential impacts resulting from existing avalanche hazards would increase due to increased vehicular traffic during mine operations and reclamation/closure activities. DAC (2021) identified 38 avalanche paths along the Burntlog Route, mostly D2-sized avalanche paths and four potential D3-sized paths.

Existing avalanche hazards on the Johnson Creek Route would continue to exist and could impact travel during the construction period when this route would be the primary access to the SGP. DAC (2021) identified 94 avalanche paths along the Johnson Creek Route, mostly D2- and D3-sized avalanche paths and five D4 paths.

The Burntlog Route is generally viewed as having less susceptibility to avalanche hazards than the Johnson Creek Route (Section 3.2), as the proposed Burntlog Route generally runs higher up on the ridgelines; therefore, not crossing through potential large avalanche paths (DAC 2021). Potential for small avalanches (i.e., D2-sized) would increase due to the higher position of the road in the avalanche track.

Perpetua is using information collected on avalanche hazards to develop potential EDFs with respect to avalanches including:

- Map locations where small-sized avalanches frequently occur and include these locations in safety plans to inform drivers of areas of potential risk.
- Periodically update the mapping before the next snow season if wildfire or any other large scale vegetation modification alter the size or frequency following the methods described in the Snow Avalanche Hazard Assessment for Access Roads (DAC 2021).
- Review all avalanche paths with summer and winter imagery, review topographic contours, and slope classes.
- Construct catchment areas for smaller avalanche paths on slopes on the west side of the Warm Lake Summit.
- Frequently remove snow from catchment areas/ditches or design ditches to hold most of the snow for the winter with “Jersey” barriers to increase the depth. The appropriate size of the ditch could be evaluated on a site-specific basis, which is a function of the length and incline of the slope above and the depth of the snow in a design (e.g., 10-year) winter.
- Implement an avalanche hazard management program for larger avalanches with return periods of 1 to 10 years. This could include avalanche control and/or road closure.
- Post permanent warning signage in avalanche-prone areas of D3- and D4-sized avalanches.
- Monitor winter avalanche parameters and take appropriate actions, including:
  - Daily region-scale assessments.
  - Daily weather observations, including snowpack and avalanche observations.
  - Notify SGP staff when conditions are highly unstable.
  - Close roads during periods of elevated hazard or blocked roadways.
Control avalanche initiation with explosives using helicopters, case charging, Avalauncher, hand charging, or remote control.

With the EDFs proposed by Perpetua, the size and timing of avalanche impacts to the roadways and facilities could be managed to reduce the effects. In this case, most of the effects within the immediate vicinity of the existing avalanche paths would be localized, temporary, and minor. There would be potential for localized, temporary, and major impacts from infrequent large avalanches. Once operations cease and frequency of exposure to avalanches decreases, the impacts would be localized, temporary, and negligible to minor.

Pit Slopes

Slope stability is an important aspect of designing an open pit. Pit slope instability is a safety concern for mine workers exposed to the effects of the slope instability. Additionally, slope instability issues can impact mine operations and even result in loss of ore production in extreme situations. The main concern is for overall pit slope stability which can vary with the rock characteristics around an open pit. Stronger rock characteristics can support steeper pit slopes than weaker rock. The pit slopes are built with benches that step back moving up the pit highwalls. The benches are left in place on the highwalls and act to catch and retain loose rocks that may release from the pit slopes. This raveling of individual rocks or even minor, interbench slope failures that are retained on the benches are accepted conditions but large slope failures are to be prevented during mine operations.

A probabilistic geotechnical analysis was used to evaluate overall pit slope stability and compute a Probability of Instability (POI) along specific cross-sections within each of the proposed open pits (STRATA 2014b). The slope stability analyses relied on measured characteristics of the geologic units involved in the pits and accepted modeling techniques. POI was used to design highwall overall slopes and bench configurations. In typical mining applications an acceptable POI value is in the range of 0.03 to 0.15, depending on the potential impacts of slope movement. The higher the POI number, the less stable the slope. Temporary slopes, such as the pit walls in short-lived pit operations, may have POI values near the upper end of this range, while long-term slopes have values near the lower end of the range. The calculated POI ranges for each of the proposed pits are as follows:

- Yellow Pine pit – POI 0.005 to 0.091
- West End pit – POI 0.001 to 0.007
- Hangar Flats pit – POI 0.001 to 0.012

The design of the pits includes the appropriate overall slope selection and benching design in accordance with standard engineering principles and practices. Based on the 2021 MMP pit designs, and the strength of the underlying bedrock, the relatively low POI values indicate that significant instability of the pit walls in the final pit configurations would be unlikely. Additionally, backfilling the Yellow Pine and Hangar Flats pits would eliminate slope stability concerns for the backfilled portions of the pits and reduce the overall heights of the portions of the highwalls that would extend above the backfills.

It is unlikely that failure of the pit slopes during mining would result in significant environmental impacts, other than to actual mine operations, because the effects of the slope failures would be confined
to the open pits. This conclusion is based on the durable rock types in the pit walls (granite, marble, etc.), and also because the edges of the existing open pits are still well defined since historic mining ceased.

After mining ceases, raveling of bench faces and small slope failures would largely be contained on the benches presenting localized, negligible to minor, and permanent effects. Although unlikely, any large-scale slope failure after mining ceases in the West End pit could temporarily affect pit lake level.

**Tailings Storage Facility and TSF Buttress**

The proposed locations of the TSF and TSF Buttress were evaluated in a screening process of available sites in the SGP mine area that considered: meeting design criteria and considerations for tailing storage; a TSF with low-permeability liner; tailings dewatering methodology; construction of a TSF underdrain system; containment capacity; avoidance of side-hill locations and steep topography; avoidance of excessive embankment (i.e., dam) heights; avoidance of areas that would preclude using placement of development rock as buttress material; and downstream embankment construction (Midas Gold 2016a, Appendix G).

The TSF and TSF Buttress area include a discontinuous 5-foot-thick layer of peat which would be removed along with topsoil and other potentially compressible/weak silt and clay soils encountered during construction. The underlying bedrock is more than sufficiently competent to support the proposed structures because the rock types consist of quartz monzonite, diorite, granite and rhyolite (Tierra Group 2018).

The tailings embankment would be constructed using material removed from the SODA and the Hecla heap during starter embankment construction followed by development rock sourced from on-going mine operations. The rock used in tailings embankment construction would be placed in horizontal lifts and compacted by routing the mine’s haul fleet over previously placed rock. The tailings embankment’s interior face would have a zone at least 10 feet wide that would be placed by a contractor (not mine fleet) using traditional construction methods. Rockfill would be placed in horizontal lifts of approximately 18 to 24 inches thick and compacted using traditional compaction equipment (vibratory compactor or sheepfoot roller) to provide a non-yielding base for liner construction. A fine-grained bedding layer would be placed and compacted for liner deployment. The liner bedding material’s compaction would be tested using traditional means (nuclear density gage and/or sand cone) to ensure compaction specifications are met.

All planned raises of the TSF embankment would be by downstream methods. This means that incremental raises of the embankment height would be placed on top of previously constructed portions of the engineered embankment. This style of construction provides the strongest foundation material for all portions of embankment raises, and therefore maximizes the overall strength of the embankment against failure.

The tailings embankment has been designed to meet regulatory stability criteria even in the absence of the downstream buttressing provided by the TSF Buttress. However, the tailings embankment and buttress would be constructed concurrently, with the mine haul fleet routed to the respective construction lifts as needed. The buttress would be developed in horizontal lifts, abutting the engineered tailings embankment fill (Figures 2.4-10 and 2.4-11). The presence of the buttress would enhance the overall tailings
embankment stability by providing significant additional resisting mass (70 million tons) to resist tailings embankment deformation in static or earthquake conditions.

Slope stability analyses were performed for static, or normal conditions, and for earthquake event conditions, representing pseudo-static conditions. The TSF embankment and TSF Buttress were analyzed to determine factors of safety for two potential failure surfaces: 1) full height failure of the downstream slope of the TSF Buttress; and 2) TSF dam failure assuming the buttress was not present (Table 4.2-1).

The term “factor of safety” is used to express how much stronger a feature is (e.g., tailings dam) to withstand the calculated load imposed on the structure. At a factor of safety of 1.0 the two forces (design dam strength and load) are in balance – meaning the feature is not designed with any additional safety margin to withstand the intended load. Calculated factors of safety greater than 1.0 indicate the feature has an additional safety margin against failure. The required regulatory ratio per IDAPA 37.03.05 for tailings dams under static (normal) conditions is 1.50 and under pseudo-static (earthquake) conditions is 1.0. The TSF embankment must also conform to the requirements outlined in the NDSP, which are defined in multiple FEMA publications, primarily FEMA 65 (Earthquake Analyses and Design of Dams), FEMA 93 (Federal Guidelines for Dam Safety), FEMA 94 (Selecting and Accommodating Inflow Design Floods for Dams), and FEMA 333 (Hazard Potential Classification System for Dams).

<table>
<thead>
<tr>
<th>Case</th>
<th>Static Factor of Safety</th>
<th>Pseudo-Static (Operations) Factor of Safety</th>
<th>Pseudo-Static (Closure) Factor of Safety</th>
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</thead>
<tbody>
<tr>
<td>TSF Buttress</td>
<td>4.99</td>
<td>1.95</td>
<td>3.85</td>
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<tr>
<td>TSF Dam</td>
<td>4.09</td>
<td>3.17</td>
<td>1.81</td>
</tr>
</tbody>
</table>

Source: Tierra Group 2017

Factor of Safety Values are for maximum design heights of the embankment and buttress. Minimum factor of safety for static load is 1.50; minimum factor of safety for earthquake load (pseudo-static) is 1.0 (IDAPA 37.03.05).

1 The TSF Buttress has been expanded since the calculations were made; therefore, these calculations are conservative.

Based on the slope stability analysis of the proposed design of the TSF dam (Tierra Group 2017), failure of the TSF embankment from a seismic event is considered to have extremely low probability. Therefore, analysis of failure-related environmental effects is not included in this NEPA analysis. The pseudo-static (i.e., earthquake load) factor of safety for the TSF embankment with the downstream design and buttressing, has been calculated for the design earthquake events: once in 475-year event for operations phase; and the maximum credible earthquake (MCE) event for post-closure phase. At TSF complete build-out, the operations-phase pseudo-static Factor of Safety would be 3.17, more than three times the minimum earthquake load Factor of Safety 1.00, per IDAPA Section 37.03.0. The post-closure phase Factor of Safety would be 1.81. The MCE event used for post-closure stability analysis is a much longer return period, meaning there is a lower probability of occurrence than the 475-year return period earthquake, but results in higher peak ground acceleration (see Section 3.2, for information on peak ground acceleration). Additionally, at complete build-out of the TSF, the static load Factor of Safety would be 4.09, which is well above the minimum required static Factor of Safety of 1.50 per regulations at IDAPA Section 37.03.05.
Results of the Tierra Group (2017) study indicate the TSF dam and TSF Buttress would be stable under pseudo-static conditions. Pseudo-static conditions refer to additional load potential placed on the structure due to external forces, in this case an earthquake (Tierra Group 2017).

Earthquakes are a common geologic phenomenon in central Idaho and development of certain structures (e.g., dams, bridges, pipelines) is governed by regulation. In the event of an earthquake near the analysis area, effects to 2021 MMP support facilities and associated infrastructure are expected to range from low intensity effects (e.g., ground shaking) that may or may not be noticeable, to moderate intensity (e.g., design is adequate to withstand earthquakes), with a low probability of high-intensity effects at certain structures. Effects would range from temporary (e.g., minor damage that is easily repairable) to permanent (e.g., lateral displacement at fault crossings). The geographic extent of effects would be mostly localized, within the immediate vicinity of the various facility footprints. Impacts would be reduced to moderate intensity effects through incorporation of existing geotechnical design standards and building code standards, as well as construction quality control, operations and maintenance, and surveillance.

**Midnight Pit Backfill**

The load imposed from waste rock placed in the Midnight pit backfill would be much less than the TSF Buttress and the TSF embankment. The Midnight pit backfill is large, but has a low slope, and would be placed on competent underlying bedrock with the soil removed. As such, based on currently available design and site information, this site is suitable for the proposed backfill with adherence to standard construction protocols for the placement and construction of this type of facility.

The Midnight pit backfill would be constructed within the Midnight pit once mining in that pit is completed. In the unlikely event of a large earthquake in the vicinity of the Midnight pit, some displacement of the rock fill slopes could potentially occur but this displacement would be confined to the open pit. Such impacts would be localized, permanent, and minor to moderate.

**Burntlog Route**

Access road cuts and fills would be designed to be stable under static and pseudo-static conditions. Therefore, potential impacts from constructed slope failures would be expected to be low. In the unlikely event that a large earthquake occurs in the vicinity of the Burntlog Route, local displacement of cut slopes and road fills could potentially occur. These effects would likely be temporary (e.g., damage that is repaired), localized, and minor to moderate.

**Other Facilities**

Other facilities associated with the 2021 MMP would be sited in discrete, localized areas that would be prepared with grading and engineered fills. The foundation characteristics of the proposed facilities would be examined and the facilities structurally designed for the site-specific foundation characteristics intended purposes of the facilities. Structural designs would incorporate existing geotechnical design standards and building codes.

Facilities would be designed to withstand moderate intensity seismic events. Therefore, impacts from anticipated seismic events are anticipated to be low. However, in the unlikely event that a large
earthquake occurs in the vicinity of a facility, the effects would be local, temporary (e.g., damage that is reparable), and negligible to moderate.

Utilities

Design and construction of the transmission line would allow siting of support structures to avoid obvious geotechnical hazards like landslides and rockfalls. It is expected that geotechnical issues arising from these components would be minor and their construction would follow standard engineering practices that address and prevent geotechnical failures.

Employment of current geotechnical and structural design standards during utility upgrades would allow facilities to withstand moderate intensity seismic events. Therefore, impacts from anticipated seismic events would be low. However, in the unlikely event that a large earthquake occurs in the vicinity of the SGP, effects would be expected to be temporary (e.g., damage that is reparable), localized, and negligible to minor.

4.2.2.3 Johnson Creek Route Alternative

Impacts associated with construction of the Burntlog Route would not occur under the Johnson Creek Route Alternative. However, impacts from the upgrade of the Johnson Creek Route (road widening and curve straightening along Johnson Creek Road and Stibnite Road (CR 50-412)) would require blasting, road cuts and retaining walls. Newly exposed bedrock along the constructed road cuts would become more susceptible to ice heave and wedging, which could dislodge large blocks of bedrock into the road corridor. Topographic impacts associated with Johnson Creek Road and Stibnite Road upgrades would be permanent.

The hazards from mass wasting events along the Johnson Creek Route would be increased compared to the Burntlog Route. There are more areas of landslides and rockfalls along the Johnson Creek Route (45) than there are along the Burntlog Route (26) (Figure 3.2-6). Potential avalanche paths crossed by the Johnson Creek Route (94) are more numerous than the Burntlog Route (38) and are more significant in size (D2 to D4) than along the Burntlog Route (D2 to D3). The increased numbers of mass wasting hazards along the Johnston Creek Route would be expected to result in an increased number of temporary road closures and possible accidents involving vehicles than the Burntlog Route.

As described above the number of mass wasting and avalanche hazards would be greater for the Johnson Creek Route compared to the Burntlog Route. Similar to the Burntlog Route, the size and timing of avalanche impacts to the Johnson Creek Route could be managed to reduce the effects. Most of the effects within the immediate vicinity of the existing mass wasting areas and avalanche paths would be localized, temporary, and minor to major depending on the scale of an individual avalanche or mass wasting event.

Construction of the Johnson Creek Route would require geotechnical design considerations related to widening of the existing road from the current width to up to 21 feet along with required rock blasting for bedrock cut slopes to achieve this width resulting in multiple, temporary road closures required for this construction activity. Construction of the Burntlog Route would not require as many road construction activities along the Johnson Creek Route.
The proposed helicopter access for construction and maintenance of radio repeater and cell tower sites within IRAs would reduce the area of topography and geology disturbed by construction of access to such facilities.

Impacts associated with the Maintenance Facility would occur near Landmark, a different location than under the 2021 MMP.

Topographic, geologic, and geotechnical impacts related to all other components of the SGP would be the same under this alternative as the 2021 MMP.

4.2.3 Mitigation Measures
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. Any mitigation measures are in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Geologic Resources and Geotechnical Hazards.

4.2.4 Irreversible and Irretrievable Commitments of Public Resources

4.2.4.1 No Action Alternative
Under the No Action Alternative there is no irreversible and irretrievable commitment of public resources related to geology and geotechnical hazards.

4.2.4.2 Action Alternatives
The predominant commitment of resources for the action alternatives would be from the mining, which would deplete the mineral resources in the targeted ore bodies. Gold, silver, and antimony are non-renewable resources that would be removed and then used, constituting an irreversible commitment.

Substantial labor, energy, and materials needs are anticipated throughout the life of the SGP. Utility upgrades and new infrastructure are required to facilitate mine operations and reclamation of historically damaged areas. Legacy mined waste rock would be incorporated into new construction to the extent feasible. Contaminated areas would be remediated during new construction as required and consumption of these resources would represent an irretrievable commitment for the action alternatives.

Implementation of the SGP for the action alternatives would remove the land from other uses while it is in operation, but the use would be converted back to habitat for native species and recreational uses through reclamation activities that could take up to 5 years and once successful revegetation of disturbed areas occurred which could take considerably longer, especially for previously forested areas. The temporal loss of the land for some uses would be irretrievable. However, due to the current geotechnical condition of the land, some uses are not currently possible.
4.2.5  Short-term Uses versus Long-term Productivity

4.2.5.1  No Action Alternative

Under the No Action Alternative there are no short-term use impacts to the long-term productivity of the analysis area as it relates to geology and geotechnical hazards.

4.2.5.2  Action Alternatives

Development of the 2021 MMP or the Johnson Creek Route Alternative would result in short-term and long-term impacts to geology in the area for the action alternatives. Surficial deposits and topography would undergo changes throughout the life cycle of the mine. Bedrock would primarily be impacted by depletion of the targeted ore bodies in the three pits. Short-term uses of the mineral resources would represent a beneficial use of these resources.

Consolidation and reprocessing of existing mined material at the mine site would result in improvements to geotechnical stability of site features. Post-mining reclamation is anticipated to provide an overall long-term geotechnical improvement at the mine site, facilitating the long-term productivity of the mine site.

4.3  Air Quality

4.3.1  Impact Definitions and Effects Analysis Indicators and Methodology

The indicators for the air quality resource reflect four components of air quality impact: magnitude or intensity, duration, geographic extent, and context. The issue and indicators analyzed for air quality are as follows:

Issue: The SGP may affect air quality characteristics and resources that are affected by air pollutants.

Indicators:

- Geographical extent of pollutant concentrations and deposition.
- Type and volume of air pollutants emitted, including haze precursors, airborne dust, and HAPs.
- Criteria air pollutant ambient air concentrations outside the Operations Area Boundary anywhere the public is allowed unrestricted access.
- Comparison of predicted ambient concentrations to Class I and Class II PSD increments and Significant Impact Levels.
- HAPs (including Hg) emissions and Hg deposition.
- Deposition of nitrogen and sulfur compounds in Class I and specified Class II areas.
- Near-field plume blight and far-field regional haze in protected areas.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1 (Forest Service 2012c).

Environmental consequences related to air quality are evaluated by comparing to objective, usually numerical, standards. In this case, the assessment of potential air quality impacts relies on a quantification of the emissions from the construction and operations phase of the action alternatives. It is typical practice...
for analysis of air quality effects to evaluate the period during which emissions are predicted to be highest. If the resulting indicators for that period are below the appropriate standards, then impacts for other periods can be reasonably concluded to be of lower magnitude and extent. Estimated construction, mining, and processing emissions for the 2021 MMP are discussed in the SGP Air Quality Specialist Report (Forest Service 2022a) and Appendix A of the report entitled Air Quality Analysis (Air Sciences 2021a) and from an updated modeling analysis submitted to support the air quality permitting process (Air Sciences 2020).

The assessment of potential effect regarding the air quality issue and indicators is analyzed for each action alternative in its entirety (i.e., the combined emissions of the SGP construction/operation, transmission line construction/operation, and access road activities). For the air quality impacts analysis, the basis for emissions of pollutants, including criteria air pollutants, HAPs, sulfuric acid mist (H₂SO₄), Hg, and hydrogen cyanide, was the year of mine operations with the highest level of overall emissions.

4.3.1.1 Analysis Area Methodology

There are several Class I areas within a 300-km radius of the SGP Operation Area Boundary; however, many of these are farther from the SGP, and in the same general cardinal directions as the four closer Class I areas. A tiered approach was adopted to analyze the closer Class I areas that would have greater potential for air quality or visibility impacts. If the impacts predicted at the four closer Class I areas indicated potential for impacts at greater distances, then additional analyses would have been conducted for the more-distant Class I areas.

Four Class II wilderness areas, also shown in Figure 3.3-2, were selected by the Forest Service for far-field evaluation: FCRNRW, Gospel-Hump (GOSPEL), Hemingway-Boulders (HEMBLD), and Cecil D. Andrus - White Clouds (WHTCLD). Also, at the request of the Nez Perce Tribe, a fifth far-field region was included: the Nez Perce Requested Analysis Area.

The FCRNRW area is a large wilderness area adjacent to the SGP Operations Area Boundary and extends more than 50 km from that boundary. For purposes of far-field analysis, only the portion of the FCRNRW that lies beyond 50 km from the Operations Area Boundary was considered. The regions of the FCRNRW that are within 50 km of the SGP were included in the near-field analysis area, which allows the impacts to be evaluated using dispersion models that are suitable for such distances.

4.3.1.2 Air Emissions Inventory Methodology

Direct effects are defined as those which are caused by the action and occur at the same time and place. Indirect effects are those that are caused by the action and occur later in time or are farther removed in distance but are still reasonably foreseeable. Because the direct and indirect air quality effects related to concurrent construction and operations are not distinguishable, a complete air emission inventory is to consider mine operations, ore processing (including refining), ongoing development of the SGP, support facilities, access roads, utilities (transmission line construction), and off-site facilities. For purposes of these analyses and IDEQ permitting, separate air pollutant emission inventories were assembled for:

- Criteria air pollutants addressed by NAAQS: CO, NO₂, PM₂.₅, PM₁₀, SO₂, O₃, and ozone precursors (e.g., NOₓ and volatile organic compounds [VOCs]);
HAPs, including Hg, arsenic, antimony and hydrogen cyanide (HCN);

Non-criteria pollutants: total PM, H_2SO_4, hydrogen sulfide; and

GHGs.

The detailed emission inventories described in the Air Resources Specialist Report (Forest Service 2022a) provide the source and selection rationale for the various factors that were used. This methodology applies to criteria, non-criteria, and HAP emissions estimates. The selected emission factors and estimation techniques are provided in regulatory and industry technical documents (Forest Service 2022a).

The air emissions inventory for the 2021 MMP is based on calculations for each emission source, for each LOM year.

**Criteria Pollutant Inventory Methods**

Mine operations involve numerous emission source categories characterized by the type of process, material processed, and equipment used. Most of the methods used to estimate emissions follow the accepted techniques that are described in EPA Document AP-42, Compilation of Air Pollutant Emission Factors (EPA 1995). This compilation is the largest single reference used to develop air emission estimations and is maintained as an EPA website resource. Emission inventories were developed for two different mine operating scenarios. One inventory was applied to support the full range of analyses (including the processes non-regulated by IDEQ) and a second inventory applied only to the NAAQS regulatory analysis by IDEQ that supported the New Source Review for the state PTC (Forest Service 2022a). For each inventory, activity-specific (e.g., drilling, blasting, material crushing and conveying, refining, and other ancillary sources and activities) emissions were estimated based on the maximum activity rates for mining and production sources, coupled with applicable emission estimation techniques. Emissions were calculated on a short-term (hourly) and a long-term (annual) basis for ore processing, mine operations, and construction activities.

During full production, the daily ore-milling and processing rate would range from 20,000 to 25,000 tons per day (tpd). To ensure a conservative analysis, maximum daily ore processing emissions for the two inventories were based on the maximum design rate of 25,000 tpd, and this rate was assumed to be maintained for each annual operating scenario. Maximum annual emissions for the processing sources were based on the maximum daily emissions and multiplied by 365 days per year. Both the 2021 MMP and New Source Review inventories from a processing perspective are essentially identical.

**Non-Criteria and HAP Inventory Methods**

Most of the non-criteria and HAP emissions from operations come from the combustion of fossil fuels, processing of gold-bearing ore, and fugitive dust containing trace metals. For the SGP, emission estimates from these sources include:

- Organic and inorganic HAP from combustion of propane and diesel fuel in stationary sources, non-road engines, and vehicles;
- Hg from gold ore refining sources (e.g., autoclave, carbon kiln, retort, and induction furnaces);
- Hg from exposed surfaces (stockpiles, development rock, tailings, and pits);
- Fugitive dust containing Hg released from mining and ore processing activities;
- HCN volatilization from the dilute cyanide solution in leach tanks, carbon-in-pulp tanks, and HCN detoxification tanks; Release of trace amounts of residual HCN contained in the TSF impoundment; and
- Arsenic emissions from mining dust derived from development rock and ore concentrations.

Combustion of propane and diesel fuels in stationary and mobile sources comprise a substantial source of HAP emissions for the SGP. Most notably, in line with permitting procedures, the mobile engine tailpipe emissions were not considered in the IDEQ New Source Review regulatory inventory. The non-regulatory inventory for the analysis did include these mobile source tailpipe criteria and HAP emissions.

Emissions of Hg result from mine operations due to the natural Hg content in the mined materials and from several thermal steps in the refining of the extracted gold (e.g., retort, carbon regeneration kiln, induction furnaces). Estimates of these emissions were based on regulatory compliance emission test results available for several gold mines in Nevada that use the same type of extraction process (Nevada Division of Environmental Protection 2006, 2015, 2016).

Evaluation of potential Hg emission impacts was conducted, in part, to verify that emissions would comply with the EPA Hg emission standards provided in 40 CFR 63, Subpart EEEEEEE, for gold ore processing and production facilities.

Sources of HCN emissions include volatilized HCN from several types of tanks used to extract gold from crushed ore (leach tanks, carbon-in-pulp tanks, HCN detoxification tanks). Process tailings that contain trace amounts of residual HCN impounded in the TSF are the largest source of volatized HCN. These emissions were estimated using published EPA field test data derived from HCN flux measurements at active gold processing facilities in Nevada and estimated physical properties specific to the SGP gold-refining processes (i.e., area, temperature, pH, HCN concentration) (Schmidt and Card 2010).

Comparison of 2021 MMP and New Source Review Inventories

The 2021 MMP inventory examined projected levels of mine development and operation for each LOM year. Emissions from mine operations (drilling, blasting, material extraction and movement, mobile machinery use, lime kiln and other ancillary sources) vary significantly year to year. Therefore, annual emissions were calculated based on the maximum annual activity/production rates for each LOM year. The year with the highest level of overall criteria pollutant emissions, LOM 6, has been used for the analyses.

IDEQ, as the regulatory authority for the NAAQS compliance analysis, has approved an alternative emissions inventory to support the state PTC New Source Review process. This inventory, referred to here as the PTC New Source Review inventory, included the same emissions sources (both fugitive and
stationary), but excludes mobile source tailpipe emissions. Additionally, the PTC New Source Review inventory is the basis for a multitude of hypothetical operating scenarios for NAAQS modeling.

The full inventories of emissions for the 2021 MMP analysis and for the operating scenario comprising the approved PTC New Source Review inventory are provided in Appendices A and B of the Air Quality Specialist Report (Forest Service 2022a). There are a number of differences to note between the emissions inventories for the IDEQ permit and this EIS. The inventories used for the 2021 MMP analysis include fugitive dust emissions from the Burntlog Route, as well as mobile tailpipe emissions from on-site mobile equipment. These sources were not included in the PTC New Source Review inventory because state regulations do not require mobile sources to be covered by the PTC. Other emission levels have been revised in the PTC New Source Review emissions inventory in accordance with IDEQ's specific operating condition assumptions. This resulted in a PTC New Source Review inventory with generally larger emission rates for the SGP than those reflected in the 2021 MMP analysis inventory (Air Sciences 2020). For further detail refer to Section 4.3.2. Table 4.3-1 summarizes the different source categories and action alternatives that were considered in each of the emission inventories.

Table 4.3-1 Comparison of 2021 MMP and PTC New Source Review Inventories

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<thead>
<tr>
<th>Emission Inventory</th>
<th>Used for 2021 MMP Analysis</th>
<th>Used for IDEQ NAAQS Analysis</th>
<th>Action Alternative Basis</th>
<th>Mobile Source Tailpipe Emissions</th>
<th>Burntlog Route Fugitive Dust</th>
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<td>2021 MMP(^2)</td>
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<td>2021 MMP</td>
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</table>

Table Sources: \(^1\)From Perpetua PTC application (Air Sciences 2020); \(^2\)Air Sciences 2021a

The 2021 MMP inventory includes both dust and tailpipe emissions from vehicle travel for mine construction and operation periods. The traffic emissions included projected workforce, supply, and haulage vehicles (buses, light, and heavy trucks) and road maintenance equipment (graders and dozers).

4.3.2 Near Field Air Quality Analyses

This section provides an overview of the air dispersion modeling methods, procedures, and datasets used for the near-field assessment. Additional details are provided in the Air Quality Analysis (Air Sciences 2018a, 2021a). Figure 3.3-1 illustrates the extent of the near-field modeling domain. The near-field air quality analyses were conducted in accordance with EPA Guidelines for regulatory air modeling (40 CFR 51, Appendix W) and included the following:

- Ambient air quality analyses to evaluate compliance with NAAQS and compare to Class II increments and Significant Impact Levels (SILs);
- \(\text{O}_3\) and secondary fine particulate formation analysis;
- Screening visibility and plume blight analysis;
- Screening Hg deposition analysis; and
- Screening nitrogen and sulfur species deposition analysis.
The PTC New Source Review inventory indicates that the SGP would qualify as a minor source for New Source Review applicability (based on IDEQ review and approval). Additionally, an analysis was required to ensure that the new emission sources do not cause or contribute to an exceedance of ambient air standards provided in the NAAQS. The PTC New Source Review emissions are based on a hypothetical maximum possible production mining rate of 180,000 tons/day of ore and development rock. This is higher than the 2021 MMP analysis that proposes a highest realistic annual production of 36.3 million tons, or approximately 99,500 tons per day (Air Sciences 2021a). This is the actual highest total mining rate proposed by Perpetua in the 2021 MMP and is considered to be reasonably foreseeable for the analysis. Lastly, the PTC evaluated numerous scenarios where all 180,000 daily tons were allocated to specific locations throughout the mine. This approach was performed to ensure ease of permitting and not representative of real-world operations.

SILs are defined concentrations of criteria pollutants in the ambient air that are considered inconsequential in comparison to the NAAQS. A project impact shown to be below a SIL can be presumed to not cause or contribute to the violation of a NAAQS.

### 4.3.2.1 Ambient Air Quality Refined Modeling

The current version at the time of analysis (19191) of the American Meteorological Society/EPA Regulatory Model (AERMOD) dispersion analysis modeling system was used for this air quality analysis. Details of the modeling approach may be found in the Air Quality Specialist Report (Forest Service 2022a).

Modeling of background sources was not warranted for this near-field analysis, because the region is generally rural, and large sources of air emissions are absent. The contribution to air quality conditions from background sources is accounted for in the selected baseline concentrations for the NAAQS analysis. These baseline concentrations were added to the highest modeled off-site concentrations due to the SGP sources, as represented in the PTC New Source Review inventory.

Monitored background or baseline concentrations should reflect the existing air pollutant concentrations in the modeling domain. The total ambient concentrations were estimated by aggregating existing baseline concentrations to the modeled future ambient concentrations resulting from the SGP. Background concentrations for CO, O₃, NOₓ, and SO₂ used in the modeling were in accordance with IDEQ recommendations.

The baseline concentrations for particulate species were derived from on-site monitoring data provided by Perpetua, obtained by operation of an IDEQ-approved monitoring program (IDEQ 2015). The pollutant baseline concentrations accepted by IDEQ for the PTC air quality analysis, in units of µg/m³, are listed in Table 4.3-2.
### Table 4.3-2  Background Pollutant Concentrations for IDEQ PTC Air Quality Analysis

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Background Conc. (µg/m³)</th>
<th>Primary NAAQS¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8 hours</td>
<td>1,110</td>
<td>10,000 µg/m³</td>
</tr>
<tr>
<td>CO</td>
<td>1 hour</td>
<td>1,740</td>
<td>40,000 µg/m³</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>0.9</td>
<td>100 µg/m³</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hour</td>
<td>4.3</td>
<td>188 µg/m³</td>
</tr>
<tr>
<td>O₃</td>
<td>8 hours</td>
<td>117.7</td>
<td>137 µg/m³</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>37.0</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>Annual</td>
<td>3.5</td>
<td>12 µg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hours</td>
<td>15.0</td>
<td>35 µg/m³</td>
</tr>
<tr>
<td>SO₂</td>
<td>1 hour</td>
<td>12.3</td>
<td>196 µg/m³</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>16.8</td>
<td>1300 µg/m³</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a, WSU 2018

¹NAAQS units are shown to agree with the modeling analysis approved by IDEQ. Gaseous pollutant µg/m³ to ppb conversion 1 ppb equals: NO₂: 1.88 µg/m³; SO₂: 2.62 µg/m³; CO: 1.145 µg/m³; O₃: 2.0 µg/m³.

µg/m³ = micrograms per cubic meter. CO = carbon monoxide. NO₂ = Nitrogen dioxide. PM₁₀ = particulate matter 10 microns in diameter and smaller. SO₂ = Sulfur dioxide. O₃ = ozone. PM₂.₅ = particulate matter 2.5 microns in diameter and smaller.

AERMOD requires an input of hourly meteorological data to estimate pollutant concentrations in ambient air resulting from modeled source emissions. For this analysis, 1 year (January 1, 2014 to December 31, 2014) of site-specific hourly surface meteorological data collected at the Stibnite monitoring station was used. The methods and procedures used to collect this dataset were reviewed by IDEQ and approved in December 2013 (IDEQ 2013) based on the PSD meteorological data quality requirements specified in the EPA Appendix W Guidelines.

As the SGP is considered a minor source for New Source Review, it is not required to show compliance with the PSD increments as part of its minor New Source Review air permit application unless requested by IDEQ to do so. However, due to its proximity to the FCRNRW area and the Nez Perce Requested Analysis Area, the Class II air quality analysis performed for the 2021 MMP analysis did include an assessment of the significance of SGP air quality impacts by comparison to the Class II PSD increments (Air Sciences 2018b). The near-field modeling performed using the 2021 MMP inventory was used to compare predicted ambient concentrations to the Class II increments at the areas of interest.

The following descriptions of the air impact analyses methods apply to the 2021 MMP impact analyses only. Additional details on the methods and approaches used in the air quality impact analysis can be found in the Air Quality Specialist Report (Forest Service 2022a).

#### 4.3.2.2  Ozone and Secondary PM₂.₅ Analyses

A quantitative evaluation of the impacts of ozone and secondary PM₂.₅ resulting from action alternative sources was performed, applying guidance issued by the EPA (Air Sciences 2018b). These two criteria air pollutants are formed through chemical reactions in the atmosphere, so they are referred to as “secondary pollutants.”
In January 2017, the EPA promulgated an update to its Guideline on Air Quality Models (EPA 2017) in 40 CFR 51, Appendix W (1978), to incorporate a tiered demonstration approach to address the secondary chemical formation of ozone and PM$_{2.5}$ associated with precursor emissions from single sources. The 2017 Guideline on Air Quality Models which outlined a two-tiered approach for addressing single-source ozone and secondary PM$_{2.5}$ impacts was used for the SGP analysis (Forest Service 2022a).

According to the EPA guidance, air quality modeling of hypothetical industrial sources that have similar source characteristics and emission rates of ozone precursors, and which are in similar atmospheric environments, are generally suitable for comparative assessments. To evaluate ozone impacts for the SGP analysis, an assessment was performed based on review of the EPA’s Modeled Emission.

The EPA Rates for Precursors guidance document, which includes hypothetical source photochemical grid model (PGM) results was applied for this analysis (EPA 2019d). The PGM is a regional-scale atmospheric model that accounts for ozone-forming reactions and assigns the predicted ozone results as background to hypothetical sources of ozone precursors. This selected PGM source used in this case (number 18 in the PGM source roster) is the geographically closest to the SGP—210 miles (336 km) west-northwest of the SGP—in northeastern Oregon. Ozone impacts reported for the selected hypothetical source at a specified emission level were scaled to reflect the action alternative emission levels to estimate ozone impacts. The calculated estimates for ozone and secondary PM$_{2.5}$ concentration changes were added to the baseline concentrations to determine total estimated SGP ozone impacts for comparison to the NAAQS (Air Sciences 2018b).

### 4.3.2.3 Plume Visibility Screening Analysis

Plume visibility analysis is a means of quantifying the ability of a viewer to discern a visible plume released from a source and is usually evaluated for an observer at the closest point on the boundary of a Class I or Class II wilderness area of concern. For the SGP plume visibility analysis, the most recent version of the EPA visibility impairment screening model (VISCREEN, version 13190) (EPA 1992) was used to determine if a plume released from the 2021 MMP sources could potentially be visible by a human observer.

The VISCREEN model was run using site-specific wind data to estimate the worst-case visibility impacts for worst-case meteorological conditions (wind speed and stability) (EPA 1992). The annual background visual range of 270 km for the SGP location was provided by the Forest Service and is representative of IMPROVE visual range data in the region. Additional details of the VISCREEN analysis procedures are provided in Air Sciences (2018a).

To operate VISCREEN, the aggregated emissions from the action alternative sources were arranged to be released from a single point. This creates some uncertainty, because the emissions from the SGP and process operations area would spread out over several miles. To account for dispersed emission sources, accepted modeling practice is to determine a theoretical single-point plume origin correction distance. The calculated distance in this case was 17.8 km. Subsequently, this distance was added to the hypothetical observer distance at the FCRNRW area boundary, and the combined observer distance was used in the VISCREEN inputs.
Both daytime and nighttime hours were included in this analysis, although it should be recognized that any plume that occurs at night would not have sunlight to illuminate it.

The VISCREEN modeling treated PM emissions from combustion as soot and PM emissions larger than PM$_{10}$ were added to the model. For details refer to Appendix C of the Air Quality Analysis Addendum ModPro2 memorandum (Air Sciences 2021a).

### 4.3.2.4 Mercury Deposition Analysis

In the atmosphere, the forms of Hg that contribute to the deposition to land and surface waters are gaseous Hg (Hg$^{2+}$), particulate-borne Hg (HgP), and gaseous elemental Hg (Hg$^0$). Further speciation of the particulate forms of Hg is possible such as fine HgP, which is analogous to filterable and condensable PM$_{10}$. Essentially, the PM$_{10}$ associated with HgP is the mercury bound within the particles of the particulate smaller than 10 microns. Appropriate particle distribution of mercury can be established using proper test methods and techniques, but the overall percentage of HgP compared to total Hg is small, with HgP PM$_{10}$ being even less (~14.1 percent vs 2.4 percent from a coal boiler as an example) (Peng 2021).

However, as discussed below, and in further detail in Section 4.3.4.2, the approach applied for this analysis did not speciate HgP. The assessment of Hg deposition for the locale of the SGP was conducted using two different tools. EPA computer simulation results based on the Regional Modeling System for Aerosols and Deposition (REMSAD) are available to quantify Hg deposition in each of the lower 48 states (EPA 2008).

This modeling was based on Hg emission inventory data obtained from 2000 through 2006, so would be expected to be higher than more-recent Hg emission levels that reflect regulatory limitations. The REMSAD results were used to estimate background deposition in the locale of the SGP area. Sources of Hg deposition included in the EPA REMSAD modeling analysis were:

- Point- and area-source emission sources in the lower 48 U.S.;
- Emissions from sources in Canada and Mexico; and
- Global background deposition from the Chemical Transport Model, the Global/Regional Atmospheric Heavy Metals model, and the GEOS-Chem model (EPA 2008).

The second analysis tool to assess the contribution to Hg deposition due to the 2021 MMP sources was screening-level dispersion simulation using AERMOD. It is recognized that AERMOD does not simulate the key physical processes affecting Hg in the environment (e.g., chemical transformation, re-emission, wet deposition, etc.) that are included in other models of Hg deposition. However, AERMOD was used in this case as a screening tool, to quantify the potential for increases in deposition of Hg species that could lead to impacts to biota. Complete discussion of the AERMOD method details and calculations are provided in the Air Quality Analysis report (Air Sciences 2018b).

### 4.3.2.5 Nitrogen and Sulfur Deposition Screening Analysis

To evaluate near-field deposition due to action alternative sources of NOx and SO$_2$, screening-level modeling was conducted using AERMOD for nitrogen and sulfur species. As in the case of Hg deposition, it is recognized that AERMOD does not include several physical processes involved in chemical deposition (e.g., atmosphere chemical transformation of NO$_2$ and SO$_2$) found in traditional acid
deposition models. However, for purposes of this assessment, it served as a screening tool to conservatively identify potential for adverse deposition effects.

This screening analysis was conducted using the Level 2 procedures prescribed in the draft interagency near-field deposition modeling guidance (NPS 2011). The Level 2 analysis assumes that 100 percent of the NO/NO₂ emissions are promptly transformed into soluble nitric acid on release to the atmosphere. This assumption results in a significant overestimation of potential nitrogen species deposition close to the facility and is viewed as conservative.

4.3.3 Far-Field Air Quality Analyses

Another area of air quality impacts was analysis of potential effects in Class I and Class II areas surrounding the SGP area. The Class I areas within 300 km of the Operations Area Boundary are shown in Figure 3.3-2. The distances and direction between the proposed SGP and the closest boundary of these Class I areas are listed provided in the SGP Air Quality Specialist Report (Forest Service 2022a). As described below, a less extensive area was defined as the far-field modeling domain, and several Class II wilderness areas were considered along with the selected Class I areas.

The far-field analysis focused on four Class I areas that were among the closest to the SGP, and in different cardinal directions relative to the SGP area: SAWT, Selway-Bitterroot Wilderness (SELW), HECA, and CRMO. The adopted approach was to discern if potential impacts above thresholds were predicted in these areas. Assessment of impacts in these closer Class I areas are conservatively representative of impacts in the areas not included in the model.

Four Class II wilderness areas also were included in the far-field analysis: FCRNRW, GOSPEL, HEMBLD, and WHTCLD. The FCRNRW area is a large wilderness adjacent to the Operations Area Boundary that extends well beyond 50 km from this boundary. For purposes of the far-field analysis, only the portion of the FCRNRW that lies beyond 50 km was considered in far-field modeling. The Nez Perce Requested Analysis Area also was included in the far-field analysis of visibility effects and chemical deposition impacts. The locations of these Class II areas of concern within the modeling domain are illustrated in Figure 3.3-2.

4.3.3.1 Modeling Methodology for Far-Field Analyses

For the far-field analyses, the CALPUFF dispersion model was selected. The CALPUFF model is a non-steady state, Lagrangian “puff” model that simulates the transport and chemical transformation of discrete puffs of pollutants released into the atmosphere. As wind flow changes geographically from hour to hour after the release, the path of each puff is altered by the model to follow the changing wind direction.

Additional details of the meteorological data assessment procedures for operation of CALPUFF are presented in the Air Quality Analysis report (Air Sciences 2018b).

Sources from the near-field AERMOD modeling files were used to build the CALPUFF inputs, with some significant differences. For point sources having exhaust at ambient air temperature (e.g., dust control baghouses), the CALPUFF model differs from AERMOD, because it sets a constant release temperature approximating ambient air temperature (293.15 degrees Kelvin). In AERMOD, the mine pit sources were modeled as rectangular volume sources (OPENPIT routine), with individual lateral
dimensions and release heights for each pit used to calculate initial vertical dispersion parameters. In CALPUFF, the pit sources were modeled as square area sources located with a release height at the top of the pit opening, with the pit located from the AERMOD lateral dimensions. The primary SGP plant access road (Burntlog) was modeled in AERMOD using several defined “line” sources. In CALPUFF, this access road was modeled as a set of widely spaced “volume” sources (Air Sciences 2018a).

Receptors for each Class I area were downloaded from the NPS Class I Area Receptors website (NPS 2018). For the Class II wilderness areas, receptor elevations were determined using the AERMAP program. Receptors were placed in the interior of each wilderness area at a 2-km grid spacing starting at 50 km from the SGP.

4.3.3.2 Far-Field Regional Haze Assessment Procedures

For the far-field assessments of regional haze impacts, the MESOPUFF II five-pollutant (nitric acid [HNO₃], NOₓ, NO₃, SO₂, and SO₄) conversion algorithm was applied in CALPUFF to simulate atmospheric chemistry effects and contribution to regional haze. Action alternative source emissions were set at the LOM 7 of the DEIS Alternative 2 maximum daily 24-hour emissions of NOₓ, SO₂, SO₄, and fine and coarse PM. Additional details of the CALPUFF processing and post-processing methods are presented in the far-field modeling protocol and the Air Quality Analysis report (Air Sciences 2018a, 2018b). Note that Far-Field modeling was not completed a second time, rather a validation comparison was performed to demonstrate no significant changes to impact concentrations resulted between the DEIS and 2021 MMP. For further details refer to Section 4.3.4.2 Far-Field Analysis.

Use of the annual average natural visual range conditions and visibility background values are usually recommended by federal land manager guidance for Class I areas. The average natural conditions for the four Class I areas in this analysis were obtained from the IMPROVE sites representing those areas (Copeland 2018). For the Class II wilderness areas, Forest Service-recommended HECA background values were used for the Nez Perce Requested Analysis Area, and median background values from the four nearest Class I IMPROVE sites were used for the remaining Class II wilderness areas (Copeland 2018).

4.3.3.3 Far-Field Comparisons with Class I and Class II Increments

As the SGP is considered a minor source for New Source Review, it is not required to show compliance with the PSD increments in either Class II or Class I areas. In view of proximity of the SGP to the FCRNRW area and the Nez Perce Requested Analysis Area within a 50 km distance, a comparison of SGP air quality impacts with the Class II PSD increments was conducted as part of the near-field analysis. Similarly, the far-field CALPUFF modeling was used to perform a comparison between maximum ambient concentrations with Class I and Class II increments for the areas of interest in the far-field domain beyond 50 km.

It should be noted that this modeling was based on the 2020 DEIS Alternative 2 inventory that includes the on-site generation of lime. This inventory was shown to have somewhat higher overall criteria pollutant emissions, generally due to the added combustion emissions of the lime kiln. Therefore, it was considered conservative to perform this increment comparison for the action alternative with the higher quantified emissions. This Alternative 2 inventory includes fugitive tailpipe emissions from vehicles
operating at the SGP, in common with other non-regulatory modeling analyses such as the regional haze contributions and deposition screening modeling.

4.3.3.4 Far-Field Deposition Assessments

Total potential annual N and sulfur (S) deposition from action alternative sources was determined as part of the air quality far-field analyses. The POSTUTIL routines in the CALPUFF model predict the deposition fluxes for both these chemical species at the receptors placed in the areas of concern. These post-processing routines were used to calculate the nitric acid/nitrite concentrations levels at each receptor, accounting for the hourly-occurring humidity and temperature conditions. Similarly, POSTUTIL routines in CALPUFF were applied to predict sulfuric acid/sulfate concentrations at each receptor. The modeling results for total potential N and S deposition are expressed in terms of the quantity of those two elements. Both dry and wet deposition were considered. Deposition impacts were compared to the Deposition Analysis Thresholds (DAT) as outlined in federal land manager guidance on N and S deposition (NPS 2011). In this guidance, the significance level for N and S deposition rates in Class I areas is listed as 0.005 kg/ha-yr.

4.3.4 Direct and Indirect Effects

4.3.4.1 No Action Alternative

In the No Action Alternative, there would be no surface (open-pit) mining or ore processing to extract gold, silver, and antimony, as described for the action alternatives. Therefore, the air emissions described for the 2021 MMP or similar emissions for other action alternatives, would not occur. Perpetua may continue to implement surface exploration and associated activities that have been previously approved on NFS lands as stated in the Golden Meadows EA (Forest Service 2015c). Air emissions and related minor impacts for these activities, which are much lower than emissions under the action alternatives, would continue. These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the SGP. Construction of these facilities in the future would result in temporary air quality effects due to earthmoving and equipment tailpipe emissions, which are described in the Golden Meadows Exploration Project EA (Golden Meadows EA) (Forest Service 2015c).

Perpetua would be required to continue to comply with reclamation and monitoring commitments included in the Golden Meadows EA, which include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using standard reclamation practices, and monitoring to ensure that sediment and stormwater BMPs are in place. These construction and reclamation activities would result in temporary and intermittent air quality effects due to earthmoving and equipment tailpipe emissions.

In January 2021 Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining
wastes. There would be temporary air quality effects related to the earthmoving and tailpipe emissions from the construction equipment and vehicles used to access the site. This work is planned to occur between 2022 and 2024.

If none of the action alternatives proceed, the current uses by Perpetua and other users on patented mine/mill site claims and on the PNF and BNF would continue to follow all existing applicable air quality regulations. Uses of NFS lands that may result in air pollutant emissions include mineral exploration, dispersed OHV use, snowmobiling, and other forms of recreation.

4.3.4.2 2021 MMP

Construction and Operations Description

The construction of the 2021 MMP includes building power transmission, access roads, and mining/processing facilities. These operations are to be performed during LOM 1 through LOM 3. Operations would begin in LOM 4 through LOM 18. Access road construction would consist of development of the Burntlog Route for mine access and minor improvements for the Johnson Creek route. Also, while the Burntlog Route is being developed, a temporary groomed OSV trail would be constructed on the west side of Johnson Creek from Trout Creek to Landmark for public access. Other public access construction would be a Cabin Creek Road groomed OSV trail. Eight borrow sources along the Burntlog Route would also be constructed.

During operations, public access through the site would be provided by constructing a new road around the Yellow Pine pit and below the mine haul road to link Stibnite Road to Thunder Mountain Road. Public access would also be allowed on the Burntlog Route.

Lastly, operations would include communication towers and an offsite logistics and road maintenance facilities. A cell tower would be located north of the Hangar Flats pit with very high frequency repeater sites. There would also be a communication site at the SGLF with upgrades to the existing site. The Burntlog road maintenance facility would be located approximately 4.4 miles east of the junction of Johnson Creek Road and Warm Lake Road along the proposed Burntlog Route.

Construction and Operations Air Emissions Inventory

Air pollutant emissions were initially estimated for activities and process sources included in the 2021 MMP for each LOM year. The LOM years presented in this discussion are based on years starting with LOM 1 as the first year of construction. LOM 6 is expected to produce the highest overall annual total of criteria pollutant emissions.

Air pollutant emission point sources for the construction phase would include engine-driven generators, portable conical crusher and screens, diesel-fired heaters, and engine-driven air compressors. The fugitive sources related to mine construction and operations would be haul, access, and construction road dust from vehicle travel during the pre-production years, as well as earth-moving equipment, material transfers, storage in several construction stockpiles and waste rock piles, tailpipe emissions and exploratory activities. The use of ANFO explosives also would be considered a mine construction phase source, as well as an ongoing operations phase source.
In the air emissions inventory, mining and ore processing operations are assumed to be capable of continually operating 365 days per year, so annual emissions, and ambient air and visibility impacts, were derived for that schedule. Most of the construction activities also are assumed to occur at a consistent rate for 355 days per year. Consideration of these schedules allowed emissions to be estimated on a daily-average and hourly bases for modeling purposes. This assumed schedule may produce an overprediction as weather conditions would affect the construction schedule and would suggest higher daily activity during the months of May through November, and higher short-term emission rates at these times. Details regarding the emission source roster, operating assumptions, and resulting emissions estimates are provided in Appendix A of the Air Quality Specialist Report (Forest Service 2022a).

Starting in LOM 4 (after up to 3 years of construction and pre-production activities), construction and mining activity emission sources would consist of conventional open-pit methods to extract ore and waste rock, including drilling, blasting, excavating, limestone production and hauling. The point sources for the operations phase, generally beginning in LOM 4, include many of the same sources that would be used during mine construction. Added emission sources beyond the construction phase would consist of portable and stationary engine-driven generators, two propane-fired heaters for intake vent air, the primary jaw crusher system, and the mill building sources (Midas Gold 2016a).

Control measures for air pollutant emissions are incorporated at each step of the mining and processing operations. Air pollution control measures that were proposed by Perpetua are common to both action alternatives. For the 2021 MMP, emission control devices and designs would be put in place to abate emissions of particulate matter, Hg, and criteria pollutant emissions from internal combustion engines. Assessments of near-field and far-field impacts take these measures into consideration by applying emission factors based on data that include emission controls in compiling the SGP inventory. For off-highway truck travel, the efficiency of dust suppressants was based on vendor information (Air Sciences 2018c).

Tailpipe emissions for off-highway diesel engines included in the SGP are controlled by use of engines that meet Tier IV or better EPA performance standards (e.g., stationary internal combustion new source performance standards, 40 CFR 60, Subparts III and JJJJ). Roadway dust and tailpipe emissions from vehicle travel on Burntlog Route from the SGP to Landmark also were calculated for both construction and operation periods. The traffic emissions included projected workforce, supply, and haulage vehicles (buses, light, and heavy trucks) and road maintenance equipment (graders and dozers).

Perpetua would design, construct, and operate SGP facilities with air pollution controls stipulated in applicable regulations and the air quality permit issued by IDEQ. The Idaho PTC, issued June 17, 2022, includes stipulations that are based on applicable state and federal regulations, and that are consistent with best available control technology for new surface mining and processing operations. Details on the control measures and estimated control effectiveness for the action alternatives, including additional measures that would be stipulated by the Forest Service, are provided in Section 2.4.9 and the SGP Air Quality Specialist Report (Forest Service 2022a). Specific examples include:

- Adherence to a fugitive dust control plan, containing standard operating procedures for dust control, surveillance, record-keeping, and reporting as may be required under best operating practices and/or conditions of air permits under IDEQ.
• The main ore processing facility building, and coarse ore stockpile would be enclosed.

• Water sprays and dust collection systems for ore processing facility material handling activities would be installed.

• Water sprays and/or bag house dust collectors would be installed at the ore-crushing system and at ore reclaim feeders that deliver ore to the grinding circuit.

• Hg emission controls, including particulate filters and carbon adsorption filters, would treat exhaust from the precipitate retort, autoclaves, carbon regeneration kiln, and induction furnaces.

• Internal combustion engines used for the construction and operational phases (diesel- or gasoline-powered) would be maintained in a manner that would promote fuel-efficient operation, and thereby reduce tailpipe emissions.

• Off-highway diesel engines would be rated for EPA Tier IV or better emission performance; operated in compliance with federal air quality applicable to internal combustion engines (e.g., 40 CFR 60, Subparts III and JJJJ); and would observe limitations required by IDEQ air quality rules.

• Ultra-low sulfur diesel fuel would be used for mobile sources and stationary diesel engines, to comply with state regulations.

Figure 4.3-1 presents the annual emissions inventory used in the 2021 MMP air analyses for the criteria pollutants for each LOM construction and operation year as derived from the maximum operating schedule for each type of operation. The construction emissions occur primarily in the pre-production year years (LOM 1 through LOM 3 [Mine Year -3 through -1 on Figure 2.4-3]), the mining emissions and ore processing emissions occur from LOM 4 through LOM 18 (Mine Year 1 through 15). Emissions from certain mine construction components that continue during the mine operation years are included with the applicable LOM year mining emissions. Note that the maximum potential ore processing emissions would not vary over the life of the mine. This is because ore processing emissions were calculated conservatively based on constant operation at the maximum daily ore production rate of 25,000 tpd, regardless of actual yearly ore production rates each day of the year. The maximum emission rate LOM 6 shown in Figure 4.3-1 was selected as the emission inventory basis for detailed 2021 MMP assessment. Note that NAAQS compliance dispersion was conducted for all criteria pollutant for both LOM 6 and LOM 10 (Mine Year 3 and 7, respectively). A separate full New Source Review regulatory assessment was completed for the IDEQ PTC process and will not be discussed in this report (refer to the State of Idaho Statement of Basis on the IDEQ website for details).
The maximum annual pollutant emissions for the 2021 MMP analyses for each LOM year are further detailed in Table 4.3-3. The highest aggregated controlled criteria pollutant annual emissions (including fugitives) would be approximately 1,260 tons per year (tpy) and are predicted to occur in LOM 6 (Mine Year 3 on Figure 2.4-3), which would be the highest ore production year (289.7 PM$_{10}$, 65.9 PM$_{2.5}$, 535.4 CO, 335.3 NO$_x$, 7.3 SO$_2$ and 26.1 VOC). The variation in annual emissions reflects the progression in levels of mining activity in different open pits, and differing levels of haul road transport for the pits during their development (Air Sciences 2018a).

Table 4.3-3  Maximum Controlled Criteria Pollutant Emissions Summary by LOM Year

<table>
<thead>
<tr>
<th>LOM Year $^{1,2}$</th>
<th>TSP (tpy)</th>
<th>PM$_{10}$ (tpy)</th>
<th>PM$_{2.5}$ (tpy)</th>
<th>CO (tpy)</th>
<th>NO$_x$ (tpy)</th>
<th>SO$_2$ (tpy)</th>
<th>VOC (tpy)</th>
<th>Total Criteria Emissions$^3$ (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>208.0</td>
<td>61.7</td>
<td>14.7</td>
<td>461.7</td>
<td>156.2</td>
<td>0.8</td>
<td>52.3</td>
<td>732.5</td>
</tr>
<tr>
<td>2</td>
<td>302.3</td>
<td>92.2</td>
<td>24.3</td>
<td>531.3</td>
<td>220.8</td>
<td>0.9</td>
<td>56.8</td>
<td>902.0</td>
</tr>
<tr>
<td>3</td>
<td>544.0</td>
<td>145.6</td>
<td>28.5</td>
<td>641.2</td>
<td>272.1</td>
<td>1.1</td>
<td>50.9</td>
<td>1,110.9</td>
</tr>
<tr>
<td>4</td>
<td>923.1</td>
<td>268.8</td>
<td>63.9</td>
<td>495.6</td>
<td>323.7</td>
<td>7.3</td>
<td>26.5</td>
<td>1,121.8</td>
</tr>
<tr>
<td>5</td>
<td>922.8</td>
<td>270.4</td>
<td>64.7</td>
<td>491.3</td>
<td>323.0</td>
<td>7.3</td>
<td>26.3</td>
<td>1,118.3</td>
</tr>
<tr>
<td>6 $^4$</td>
<td>995.3</td>
<td>289.7</td>
<td>65.9</td>
<td>535.4</td>
<td>335.3</td>
<td>7.3</td>
<td>26.1</td>
<td>1,193.8</td>
</tr>
<tr>
<td>7</td>
<td>904.7</td>
<td>267.7</td>
<td>63.3</td>
<td>506.3</td>
<td>326.1</td>
<td>7.3</td>
<td>26.0</td>
<td>1,133.4</td>
</tr>
</tbody>
</table>

Figure 4.3-1  Timeline of Maximum Annual Emissions by Life-of-Mine Year

Figure Source: Total Controlled Emissions Data from Air Sciences 2021a.
LOM Years shown on the figure use the timeline proposed for the SGP. Perpetua timelines presented in the 2021 MMP (Perpetua 2021a) start with Mine Years -3 through -1 being construction phase (Figure 2.4-3), which equate to LOM Years 1 through 3 in this timeline.
### Table 4.3-4

<table>
<thead>
<tr>
<th>LOM Year</th>
<th>TSP (tpy)</th>
<th>PM$_{10}$ (tpy)</th>
<th>PM$_{2.5}$ (tpy)</th>
<th>CO (tpy)</th>
<th>NO$_x$ (tpy)</th>
<th>SO$_2$ (tpy)</th>
<th>VOC (tpy)</th>
<th>Total Criteria Emissions$^3$ (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>834.7</td>
<td>249.9</td>
<td>62.1</td>
<td>480.1</td>
<td>301.9</td>
<td>7.2</td>
<td>26.0</td>
<td>1,065.1</td>
</tr>
<tr>
<td>9</td>
<td>871.5</td>
<td>255.3</td>
<td>62.6</td>
<td>459.2</td>
<td>268.7</td>
<td>7.2</td>
<td>25.0</td>
<td>1,015.3</td>
</tr>
<tr>
<td>10</td>
<td>1,130.6</td>
<td>320.1</td>
<td>69.1</td>
<td>478.6</td>
<td>304.6</td>
<td>7.2</td>
<td>24.9</td>
<td>1,135.4</td>
</tr>
<tr>
<td>11</td>
<td>848.3</td>
<td>250.9</td>
<td>61.5</td>
<td>473.2</td>
<td>282.7</td>
<td>7.2</td>
<td>24.2</td>
<td>1,038.1</td>
</tr>
<tr>
<td>12</td>
<td>744.7</td>
<td>224.3</td>
<td>58.2</td>
<td>460.1</td>
<td>258.3</td>
<td>7.1</td>
<td>23.1</td>
<td>972.9</td>
</tr>
<tr>
<td>13</td>
<td>749.9</td>
<td>225.8</td>
<td>59.1</td>
<td>471.0</td>
<td>262.5</td>
<td>7.1</td>
<td>23.4</td>
<td>989.8</td>
</tr>
<tr>
<td>14</td>
<td>796.7</td>
<td>237.3</td>
<td>60.4</td>
<td>392.8</td>
<td>245.3</td>
<td>7.1</td>
<td>20.8</td>
<td>903.3</td>
</tr>
<tr>
<td>15</td>
<td>491.4</td>
<td>159.1</td>
<td>51.0</td>
<td>239.0</td>
<td>139.2</td>
<td>6.9</td>
<td>15.2</td>
<td>559.4</td>
</tr>
<tr>
<td>16</td>
<td>346.8</td>
<td>119.9</td>
<td>46.5</td>
<td>122.6</td>
<td>88.0</td>
<td>6.7</td>
<td>12.2</td>
<td>349.4</td>
</tr>
<tr>
<td>17</td>
<td>370.7</td>
<td>126.3</td>
<td>46.4</td>
<td>107.5</td>
<td>91.4</td>
<td>6.7</td>
<td>11.3</td>
<td>343.2</td>
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<tr>
<td>18</td>
<td>271.0</td>
<td>101.5</td>
<td>43.2</td>
<td>83.7</td>
<td>63.7</td>
<td>6.6</td>
<td>9.9</td>
<td>265.4</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a

$^1$ The LOM Years presented on the table represent LOM Years as numbered in this EIS. Perpetua’s ModPro2 (Perpetua 2021a) portrays the pre-operation years as negative numbers, so Mine Years are numbered as -3, -2, -1, 1 through 15 (Figure 2.4-3).

$^2$ LOM 1 through 3 (Mine Years -3 through -1) represent construction and pre-production period. Mining and processing operations are fully active in LOM 4 (Mine Year 1).

$^3$ Total 2021 MMP emissions are the sum of PM$_{10}$, CO, NO$_x$, SO$_2$, and VOC emission rates. PM$_{2.5}$ is a portion or subset of PM$_{10}$.

The predicted annual emissions summaries by source category for each criteria pollutant are provided in Table 4.3-4. It should be recognized that the stationary sources represented by the process and auxiliary category are the sources used to determine the applicability of Title V and PSD major source permitting status (mobile sources are excluded from the applicability analysis). As shown in Table 4.3-4, these emissions are less than the annual threshold of 100 tpy that would trigger Title V or 250 tpy for PSD permitting status. Emissions of particulate matter (total suspended particulate, PM$_{10}$, and PM$_{2.5}$) from fugitive sources represent the largest contributor to overall emissions. The operation of off-highway trucks and fuel-combusting equipment would constitute the largest sources of CO and NO$_x$. Due to the low sulfur content of liquid fuels that would be used for the equipment at the SGP, and the more stringent federal emission standards for the recent model-year diesel engines, the emissions of SO$_2$ and VOC are relatively low.

Dust and tailpipe emissions due to the travel of off-highway trucks and other vehicles were accounted for in the dispersion modeling within the SGP Operations Area Boundary, in the mined pits, and along the Burntlog Route from the SGP. As listed in Table 4.3-4, these emissions were based on the access road and mine road configuration proposed in the 2021 MMP. The estimated operations phase emissions for SGP vehicle travel along Warm Lake Road (CR 10-579) from Landmark to Cascade also are included.

The level of traffic and related vehicle emissions impacts beyond the town of Cascade, such as the transportation of supplies and personnel to the SGP or the shipping of antimony concentrate from the SGP, are not sufficiently predictable to be quantified. Nor is that potential operation unique to the SGP.
The vehicles involved in this off-site transportation activity have separate utility only related to the SGP and are operating in relatively large areas where any potential emissions are relatively small compared to the baseline conditions. Based on current estimates, transport of concentrate would require two truck trips per day, so the contribution to SGP emissions would be minimal (~2.9 percent or 2 of 68 AADT during mine operation traffic). However, for informational purposes, emission factors per mile of travel for fully-loaded heavy transport trucks are provided in the Air Quality Analysis report for the 2021 MMP emission inventory (Air Sciences 2021a).

Most of the HAP emissions from operations come from the combustion of fossil fuels and fugitive dust containing trace metals. Other HAP emissions include:

- Hg from gold ore refining sources (e.g., autoclave, carbon kiln, retort, and induction furnaces);
- Hg from exposed surfaces (stockpiles, development rock, tailings, and pits);
- Fugitive dust containing Hg released from mining and ore processing activities;
- HCN volatilization from the dilute cyanide solution in leach tanks, carbon-in-pulp tanks, and HCN detoxification tanks; and
- TSF impoundment of process tailings that would contain trace amounts of residual HCN.

Table 4.3-4 Maximum Annual Criteria Pollutant Emissions Summary – LOM 6

<table>
<thead>
<tr>
<th>Source Category</th>
<th>CO (tpy)</th>
<th>NOx (tpy)</th>
<th>TSP (tpy)</th>
<th>PM10 (tpy)</th>
<th>PM2.5 (tpy)</th>
<th>SO2 (tpy)</th>
<th>VOC (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing &amp; Refining</td>
<td>30.6</td>
<td>38.0</td>
<td>86.7</td>
<td>55.8</td>
<td>35.9</td>
<td>6.5</td>
<td>5.3</td>
</tr>
<tr>
<td>Mining Pit/Tailings Activity¹</td>
<td>157.0</td>
<td>107.7</td>
<td>51.9</td>
<td>13.0</td>
<td>6.2</td>
<td>0.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Blasting²</td>
<td>240.1</td>
<td>6.5</td>
<td>20.6</td>
<td>10.7</td>
<td>0.6</td>
<td>0.01</td>
<td>--</td>
</tr>
<tr>
<td>Stockpiles³</td>
<td>--</td>
<td>--</td>
<td>0.6</td>
<td>0.3</td>
<td>0.04</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Process Area</td>
<td>5.7</td>
<td>4.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.01</td>
<td>0.3</td>
</tr>
<tr>
<td>Hauling</td>
<td>96.7</td>
<td>173.8</td>
<td>721.9</td>
<td>180.7</td>
<td>20.0</td>
<td>0.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Access Roads/Heliport</td>
<td>5.3</td>
<td>4.9</td>
<td>113.2</td>
<td>29.1</td>
<td>3.1</td>
<td>0.02</td>
<td>0.6</td>
</tr>
<tr>
<td>Mining Activity Total (does not include Processing/Refining)</td>
<td>504.9</td>
<td>297.2</td>
<td>908.6</td>
<td>233.9</td>
<td>30.0</td>
<td>0.8</td>
<td>20.8</td>
</tr>
<tr>
<td>Total (Mining, Processing and Refining)⁴</td>
<td>535.4</td>
<td>335.3</td>
<td>995.3</td>
<td>289.7</td>
<td>65.9</td>
<td>7.3</td>
<td>26.1</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a
¹ Mining pits include: the Yellow Pine, Hangar Flats and the West End pits. The Tailings include Bradley Tailings and the TSF.
² Blasting emissions are the aggregate total from the three pits mentioned above.
³ Emissions are the aggregate total from the Hangar Flats and Limestone stockpiles.
⁴ Mobile sources and fugitive sources are included in the total emissions. Mobile sources are not included in the permit applicability and fugitive emissions are not considered unless the project is one of 27 PSD list Source Categories. SGP is not a PSD listed source category.

The annual HAP and toxic pollutant emissions for LOM 6 are listed in Table 4.3-5, with Hg reported in pounds per year, and the other toxics in tpy. Details regarding the HAP and air toxics operating assumptions, and resulting emissions estimates for the 2021 MMP, are provided in Appendix A of Forest
Regarding HCN emissions from gold mines, the EPA has examined U.S. gold ore processing and production facilities and concluded that measurements of HCN concentrations at these gold facilities “showed ambient concentrations below levels of public health and environmental concerns” (EPA 2010a). The HCN emissions factors were derived from the final report from a 2009 fugitive HCN report from three Nevada gold mines (Cortez, Gold Quarry and Rocky Mountain). For further detail, see Appendix A of the Air Quality Specialist Report (Forest Service 2022a) and EPA 2010b. This group of existing facilities reported HCN emission rates ranging from 0.2 to 8.8 tpy, with an average of 3.8 tpy (EPA 2010a). Therefore, the SGP estimates (1.9 tpy) are approximately one half the average rate as determined by the study.

Hg is introduced to the ore processing system through the Hg content of the ore itself. Evaluation of potential Hg emission impacts was conducted, in part, to verify that emissions would comply with the EPA Hg emission standards provided in 40 CFR 63, Subpart EEEEEE, for gold ore processing and production facilities. The SGP would be subject to these federal standards using a carbon-in-pulp process for capturing gold that has been extracted from the crushed ore using dilute NaCN solutions and use of a retort for purifying the gold-laden precipitate from electrowinning. The projected Hg emissions from the gold ore processing sources would be controlled. Control of the autoclave includes the uses of a venturi scrubber, vent gas cleaning tower, vent gas stream condensing tower and at least one sulfur-impregnated activated carbon filter.

The retort emissions are based on an average of two refinery reports in 2015/2016 (NDEP 2015, 2016). The corresponding calculations are 20 percent of the retort standard of 0.8 lb/ton. The emissions released from gold-refining processes are controlled as listed below to mitigate particulate and gaseous Hg emissions. These process exhaust control technologies are accounted for in the maximum emissions estimates in Table 4.3-5:

- Activated carbon regeneration kiln – wet scrubber and activated carbon filter;
- Retort – activated carbon canisters and filter pack; and
- Induction furnaces – baghouse filter and activated carbon filter pack.

### Table 4.3-5 Maximum Annual HAP and Air Toxics Emissions Summary

<table>
<thead>
<tr>
<th>Source Category</th>
<th>HCN (tpy)</th>
<th>H₂SO₄ (tpy)</th>
<th>As (tpy)</th>
<th>HAP (tpy)</th>
<th>Hg (lbs/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process and Auxiliary</td>
<td>1.9</td>
<td>8.9</td>
<td>0.02</td>
<td>4.7</td>
<td>5.8</td>
</tr>
<tr>
<td>Mining fugitive</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
<td>4.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>1.9</td>
<td>8.9</td>
<td>0.4</td>
<td>8.7</td>
<td>13.6</td>
</tr>
</tbody>
</table>

**Near-Field Analysis NAAQS**

Assessment of conformance to the NAAQS is based on the highest receptor concentration in the modeling domain for the pollutants and averaging times corresponding to the standards. The modeled maximum concentration at each receptor is added to the selected background concentrations that represent current
existing conditions. If the results from this computation are below the NAAQS, then impacts at other locations in the domain would be below the NAAQS as well.

For NAAQS modeling inputs, the highest emissions of each pollutant during any LOM year were determined and provided in Table 4.3-6. For the 2021 MMP, the highest criteria pollutant emissions occur during two different years, LOM 6 (CO, NOX, and SO2) and LOM 10 (PM_{2.5} and PM_{10}). Therefore, to capture the highest modeled concentration for each pollutant, separate modeling was performed for LOM 6 and 10 (i.e., two models). Note that VOC emission maximums from LOM 3 were not modeled because there is no specific NAAQS for these emissions, however VOCs are addressed as part of the secondary PM_{2.5} analysis.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>LOM Year</th>
<th>SGP Total Annual Emissions (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>6</td>
<td>535.5</td>
</tr>
<tr>
<td>NO2</td>
<td>6</td>
<td>335.2</td>
</tr>
<tr>
<td>PM_{10}</td>
<td>10</td>
<td>320.1</td>
</tr>
<tr>
<td>PM_{2.5}</td>
<td>10</td>
<td>69.2</td>
</tr>
<tr>
<td>SO2</td>
<td>6</td>
<td>7.3</td>
</tr>
<tr>
<td>VOC</td>
<td>3</td>
<td>27.4</td>
</tr>
<tr>
<td>HAPs</td>
<td>10</td>
<td>8.5</td>
</tr>
<tr>
<td>Hg</td>
<td>10</td>
<td>13.3 (lb/yr)</td>
</tr>
</tbody>
</table>

The 2021 MMP would include a 12-foot wide gravel road to provide public access from Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375) through the SGP. Perpetua received a final PTC from IDEQ on June 17, 2022. This application proposed to exclude the public road on the basis of restricted access and maintaining full control, and that people traveling on the road would be considered “guests of the mine.” IDEQ accepted the private road concept proposed by Perpetua (see PTC Condition 2.7, Response to Comments #16 and Statement of Basis on the IDEQ website) and in response to comments on February 18, 2021, also states that the roadway between Stibnite Road at Sugar Creek and Thunder Mountain Road at Meadow Creek was appropriately excluded from ambient air. Additionally, the EPA Region X has indicated that the access road could possibly be excluded from ambient air if sufficient enforceable measures are taken to comply with the 2019 revised policy (EPA 2019a). To comply with this measure, Perpetua has developed a transportation management plan and is included as Appendix D of the Air Quality Specialist Report (Forest Service 2022a).

The AERMOD dispersion modeling results for the 2021 MMP analysis emissions and comparison with the applicable NAAQS are provided in Table 4.3-7. The geographic location of the maximum impacts amongst the criteria pollutants and averaging periods between LOM 6 and 10 are provided in Figure 4 of the Air Quality Analysis Addendum ModPro2 (Air Sciences 2021a). The results demonstrate compliance with all NAAQS and would be considered to have a moderate impact locally and minor impact regionally. Additionally, Table 4.3-8 provides geographic locations of the NAAQS maximums.
### Table 4.3-7 Near-Field NAAQS Compliance Demonstration

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Maximum Modeled Conc. (µg/m³)</th>
<th>Background Conc. (µg/m³)</th>
<th>Total Impact Conc. (µg/m³)</th>
<th>NAAQS (µg/m³)</th>
<th>NAAQS Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8 hours</td>
<td>404.6</td>
<td>1,110</td>
<td>1,515</td>
<td>10,000</td>
<td>Yes</td>
</tr>
<tr>
<td>CO</td>
<td>1 hour</td>
<td>495.5</td>
<td>1,740</td>
<td>2,236</td>
<td>40,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Lead</td>
<td>3-month rolling</td>
<td>Not Required¹</td>
<td>Not Required¹</td>
<td>Not Required¹</td>
<td>Not Required¹</td>
<td>Not Required¹</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>19.8</td>
<td>0.9</td>
<td>20.7</td>
<td>100</td>
<td>Yes</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hour</td>
<td>129.8</td>
<td>4.3</td>
<td>134.1</td>
<td>188</td>
<td>Yes</td>
</tr>
<tr>
<td>O₃</td>
<td>8 hours</td>
<td>3.0</td>
<td>117.7</td>
<td>120.7</td>
<td>137</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>15</td>
<td>37.0</td>
<td>51.9</td>
<td>150</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂.⁵ ²</td>
<td>Annual</td>
<td>1.1</td>
<td>3.5</td>
<td>4.6</td>
<td>12</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂.⁵ ²</td>
<td>24 hours</td>
<td>2.7</td>
<td>15.0</td>
<td>17.7</td>
<td>35</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>1 hour</td>
<td>3.0</td>
<td>12.3</td>
<td>15.3</td>
<td>196</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>1.8</td>
<td>16.8</td>
<td>18.6</td>
<td>1,300</td>
<td>Yes</td>
</tr>
</tbody>
</table>

¹ Lead modeling is not required per IDEQ as the facility-wide emissions are less than 10 percent of the lead significant emission rate of 0.6 tpy and considered “Below Regulatory Concern”.

² Includes the secondary impacts.

³ All background concentrations are derived from the NW Airquest data (WSU 2018).

### Table 4.3-8 Near Field NAAQS Maximum Geographic Locations

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Easting (m)</th>
<th>Northing (m)</th>
<th>Distance to Boundary (miles)</th>
<th>Nearest Boundary Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8 hours</td>
<td>634,478.09</td>
<td>4,972,209.38</td>
<td>0</td>
<td>East Boundary</td>
</tr>
<tr>
<td>CO</td>
<td>1 hour</td>
<td>634,493.79</td>
<td>4,972,189.94</td>
<td>0</td>
<td>East Boundary</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>635,049.52</td>
<td>4,977,883.80</td>
<td>0.62</td>
<td>Northeast</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hour</td>
<td>635,124.52</td>
<td>4,977,758.80</td>
<td>0.59</td>
<td>Northeast</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>632,174.39</td>
<td>4,969,258.68</td>
<td>0</td>
<td>South Boundary</td>
</tr>
<tr>
<td>PM₂.⁵ ²</td>
<td>Annual</td>
<td>634,999.52</td>
<td>4,978,033.81</td>
<td>0.60</td>
<td>Northeast</td>
</tr>
<tr>
<td>PM₂.⁵ ²</td>
<td>24 hours</td>
<td>634,999.52</td>
<td>4,978,033.81</td>
<td>0.60</td>
<td>Northeast</td>
</tr>
<tr>
<td>SO₂</td>
<td>1 hour</td>
<td>635,199.52</td>
<td>4,977,533.80</td>
<td>0.56</td>
<td>East</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>634,999.52</td>
<td>4,975,933.79</td>
<td>0.56</td>
<td>East</td>
</tr>
</tbody>
</table>

Comparison of Maximum Pollutant Impacts with PSD Class II Increments

The results in Table 4.3-9 based on the 2021 MMP maximum annual inventory show the near-field maximum modeled ambient concentrations. The geographic location of the maximum impacts amongst the criteria pollutants and averaging periods between LOM 6 and 10 are provided in Figure 3 of the Air Quality Analysis Addendum ModPro2 (Air Sciences 2021a).

Given there are no substantial existing minor or major sources in the immediate vicinity of the SGP, it is viewed as unlikely that significant consumption of the PSD increment occurs in this area. Due to the relatively low maximum concentrations from near-field modeling for SGP, which are well below the PSD.
increment for all pollutants, it also is unlikely the SGP would cause or contribute to a violation of a PSD increment. The impact would be considered minor to Class II PSD areas as the project is well below the significance levels for all pollutants and averaging periods.

Table 4.3-9  Near Field Class II PSD Increment Comparison

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging</th>
<th>Maximum Conc.</th>
<th>Maximum Allowable Increase</th>
<th>PSD Increment Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>19.8</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Annual</td>
<td>6.5</td>
<td>17</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>14.9</td>
<td>30</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂.₅²</td>
<td>Annual</td>
<td>1.1</td>
<td>4</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂.₅²</td>
<td>24 hours</td>
<td>3.3</td>
<td>9</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>0.2</td>
<td>20</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>1.8</td>
<td>512</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>24 hours</td>
<td>0.7</td>
<td>91</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; EPA 2018c

1 Design Value Rank For any period other than an annual period, the applicable maximum allowable increase may be exceeded during one such period per year at any one location.

2 Includes secondary, condensable PM₂.₅ impacts. The annual SIL was revised as described in EPA Guidance issued in April 2018 (EPA 2018c).

Hazardous Air Pollutant Modeling

A supplemental air quality dispersion modeling analysis was conducted based on federally regulated HAP emissions associated with the 2021 MMP. The analysis consisted of several metal HAPs which were: antimony, arsenic, beryllium, cadmium, chromium, cobalt, manganese, nickel, and selenium from all potential emitting sources at SGP. The main source of metals emissions was from dust produced in mining and hauling/handling ore and development rock. The metals were present in this dust in natural mineral forms. Note that lead and mercury were not assessed in this modeling exercise because lead emissions are considered less than significant (see Table 4.3-7). Mercury is discussed in the Deposition Screening section below and other resource report (Air Sciences 2018a and 2021a).

The highest LOM emissions in terms of tons/yr were evaluated to establish the status of SGP from a HAP perspective, which was determined to be LOM 10. Table 4.3-10 illustrates all HAP emissions from LOM 10. The only federal requirement pertaining to HAPs is to determine whether the facility would be categorized as a Major or Area source facility for HAPs. If a source is less than 10 tpy of any single HAP and less than 25 tpy of all HAPs in aggregate, the facility is considered to be an Area Source. Based on the information provided in Table 4.3-10, SGP is an Area Source or a minor source for HAPs. IDEQ developed a toxics air pollutant program in the early 1990’s. The program is based upon health and risk standards that would apply to potential new sources and implemented with appropriate ambient levels. In addition to ambient levels, it was decided to incorporate a stack-based emission levels at or below which it could be reasonably expected that the ambient standard would not be exceeded. The reason the stack-based levels were incorporated was that often stack emissions are easier to calculate than it is to model for ambient concentrations (IDEQ 2001).
### Table 4.3-10  Highest HAP Annual Emissions LOM 10

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Emissions (tons/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Butadiene</td>
<td>0.005</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>0.107</td>
</tr>
<tr>
<td>Acrolein</td>
<td>0.014</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.017</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.394</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.403</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.004</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0002</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.003</td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td>0.063</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.020</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.005</td>
</tr>
<tr>
<td>Cyanide</td>
<td>1.988</td>
</tr>
<tr>
<td>Dichlorobenzene</td>
<td>0.000</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.193</td>
</tr>
<tr>
<td>Hexane</td>
<td>0.503</td>
</tr>
<tr>
<td>Hydrogen Chloride</td>
<td>3.666</td>
</tr>
<tr>
<td>Lead</td>
<td>0.009</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.217</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.007</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0.009</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.005</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.001</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.424</td>
</tr>
<tr>
<td>POM1</td>
<td>0.090</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.002</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.283</td>
</tr>
<tr>
<td>Xylene</td>
<td>0.237</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.668</strong></td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021b

POM = polycyclic organic matter; emissions include polycyclic aromatic hydrocarbons.

The Acceptable Ambient Concentration (AAC) 24-hour average values for non-carcinogenic HAPs were based on the American Conference of Government Industrial Hygienists (ACGIH) threshold limit values (TLV). IDEQ equates the ACC to the Occupational Exposure Limit (OEL) divided by 20. For Acceptable Ambient Concentration for Carcinogenic HAPs (AACC) the unit Risk Factors (URF) from EPA (IRIS) was used and set them equal to a risk level of one in a million (IDEQ 2001). The AACC values are annual averages.
Note that only those HAP pollutants identified at the beginning of this section were modeled because they were the only pollutants that exceeded the State of Idaho screening Emissions Levels as defined by IDAPA 58.01.01.585/586. All other HAPs did not exceed the screening level and were therefore deemed to meet state permitting requirements without further evaluation. It should be noted that the state regulations were applied for the analysis because no federal standards applied. Table 4.3-11 identifies the State of Idaho AAC/AACC as defined by the IDAPA rules referenced above. All mining years from LOM Year 3 through LOM Year 18 were modeled as discussed below.

AERMOD Modeling was conducted for the HAPs in identical fashion to the 2021 MMP NAAQS modeling (Air Sciences 2021a and 2021b). For further detail refer to the Supplemental HAP Air Quality Analysis Addendum – ModPro2 (Air Sciences 2021b).

Table 4.3-11  Idaho AAC/AACC for HAPs

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Pollutant</th>
<th>Carcinogenic¹</th>
<th>Averaging Time</th>
<th>AAC/AACC (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-36-0</td>
<td>Antimony</td>
<td>No</td>
<td>24 hours</td>
<td>25</td>
</tr>
<tr>
<td>7440-38-2</td>
<td>Arsenic</td>
<td>Yes</td>
<td>Annual</td>
<td>0.00023</td>
</tr>
<tr>
<td>7440-41-7</td>
<td>Beryllium</td>
<td>Yes</td>
<td>Annual</td>
<td>0.0042</td>
</tr>
<tr>
<td>7440-43-9</td>
<td>Cadmium</td>
<td>Yes</td>
<td>Annual</td>
<td>0.0056</td>
</tr>
<tr>
<td>7440-47-3</td>
<td>Chromium</td>
<td>No</td>
<td>24 hours</td>
<td>25</td>
</tr>
<tr>
<td>7440-48-4</td>
<td>Cobalt</td>
<td>No</td>
<td>24 hours</td>
<td>2.5</td>
</tr>
<tr>
<td>7439-96-5</td>
<td>Manganese</td>
<td>No</td>
<td>24 hours</td>
<td>250</td>
</tr>
<tr>
<td>7440-02-0</td>
<td>Nickel</td>
<td>Yes</td>
<td>Annual</td>
<td>0.042</td>
</tr>
<tr>
<td>7782-49-2</td>
<td>Selenium</td>
<td>No</td>
<td>24 hours</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021b

Carcinogenic pollutants are averaged annually; non-carcinogenic pollutants are averaged daily (24-hrs). Both emissions rates applied to the model are lb/hr or g/s averages based on the applicable timeframe 24-hr or annually.

The potential ambient concentration was calculated at each receptor for LOM 3–18. The estimated total concentrations were then compared with the Idaho AACs. For each acute HAP with a 24-hour averaging time (AAC), the highest modeled concentration (HMC) across all modeled receptors and modeling scenarios was compared with the applicable AAC, provided in Table 4.3-12.

Table 4.3-12  AAC HAP Modeling Results

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>AAC (µg/m³)</th>
<th>HMC¹ (µg/m³)</th>
<th>HMC &lt; AAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-36-0</td>
<td>Antimony</td>
<td>24 hours</td>
<td>25</td>
<td>0.0002</td>
<td>Yes</td>
</tr>
<tr>
<td>7440-47-3</td>
<td>Chromium</td>
<td>24 hours</td>
<td>25</td>
<td>0.0004</td>
<td>Yes</td>
</tr>
<tr>
<td>7440-48-4</td>
<td>Cobalt</td>
<td>24 hours</td>
<td>2.5</td>
<td>0.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>7439-96-5</td>
<td>Manganese</td>
<td>24 hours</td>
<td>250</td>
<td>0.0103</td>
<td>Yes</td>
</tr>
<tr>
<td>7782-49-2</td>
<td>Selenium</td>
<td>24 hours</td>
<td>10</td>
<td>0.00004</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021b

¹ HMC = highest modeled concentration amongst all mining years
Table 4.3-12 shows that the highest modeled 24-hour concentrations for the HAPs are less than the applicable acute AACs. The location of the maximum 24-hour modeled concentration for each acute HAP is shown in Figure 2 of the Supplemental HAP Air Quality Analysis Addendum – ModPro2 (Air Sciences 2021b).

The annual AACC values are based on IDAPA 58.01.01.586 and were developed “based on the probability of developing excess cancers over a seventy (70) year lifetime exposure to one µg/m³ of a given carcinogen and expressed in terms of a screening level or an acceptable ambient concentration for a carcinogenic toxic air pollutant.”

Each modeled HAP with an AACC was evaluated in the 2021 MMP analysis for a HMC 70-yr lifetime exposure, calculated as follows, on a receptor-by-receptor basis:

\[
\text{70 yr exposure} \left( \frac{\mu g}{m^2} \right) = \frac{\sum \text{LOM yrs 3 to 16 annual conc}}{70(\text{yrs, exposure})}
\]

The highest estimated 70-year lifetime exposure across all receptors was then compared with the AACC for each HAP modeled for the annual averaging time, as shown in Table 4.3-13.

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>AACC (µg/m³)</th>
<th>HMC 1 (µg/m³)</th>
<th>HMC &lt; AACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-38-2</td>
<td>Arsenic</td>
<td>Annual</td>
<td>0.00023</td>
<td>0.00015</td>
<td>Yes</td>
</tr>
<tr>
<td>7440-41-7</td>
<td>Beryllium</td>
<td>Annual</td>
<td>0.0042</td>
<td>0.00001</td>
<td>Yes</td>
</tr>
<tr>
<td>7440-43-9</td>
<td>Cadmium</td>
<td>Annual</td>
<td>0.00056</td>
<td>0.000003</td>
<td>Yes</td>
</tr>
<tr>
<td>7440-02-0</td>
<td>Nickel</td>
<td>Annual</td>
<td>0.042</td>
<td>0.00001</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021b

1 HMC = highest 70-yr exposure concentration amongst all mining years

Table 4.3-13 shows that the estimated highest 70-year lifetime exposure concentrations are less than AACCs. The location of the 70-year lifetime exposure concentration for each chronic HAP is shown in Figure 3 of the Supplemental HAP Air Quality Analysis Addendum – ModPro2 (Air Sciences 2021b). The results illustrate that the overall impact from the associated HAPs would be moderate, but well below the IDEQ permitting thresholds.

Ozone and Secondary PM2.5 Impact Assessment

To evaluate ozone impacts from VOC and NOX precursor emissions, an assessment was performed based on the SGP 2021 MMP emissions inventory for LOM 6, the year of highest projected mine production. For that inventory, the facility-wide potential ozone precursor emissions were estimated in that inventory to be 335 tpy of NOX and 26.1 tpy of VOCs. This assessment included SGP mobile source tailpipe emissions. Additional discussion regarding the ozone and secondary PM2.5 analysis is provided in the Air Quality Analysis report (Air Sciences 2021a).
A representative industrial source as modeled by EPA was selected from the PGM roster to assess ozone impacts. This modeled source (number 18 in the PGM source roster) is geographically the closest to the SGP; 210 miles (336 km) west-northwest of the SGP, in northeastern Oregon. Given the location of number 18 downwind from the coal-fired (550 megawatts) Boardman Power Plant (17 miles (27 km) to the west-southwest), it can be expected that this PGM source would experience higher ozone concentrations than would be expected at the undeveloped SGP area. For hypothetical source 18, ozone contributions from precursor pollutant emissions of NOX and VOCs (500 tpy each) were predicted to be 1.94 ppb and 0.46 ppb for NOX and VOCs, respectively (Air Sciences 2018a; EPA 2019d).

On this basis, the corresponding ozone impact due to the 2021 MMP sources was estimated by linearly scaling the source number 18 ozone impact by the relative precursor emission rates of the PGM source and the 2021 MMP. The result is provided in Table 4.3-14. This table also shows the baseline ozone concentration and the estimated total concentration for the highest modeled receptor. This analysis shows that the maximum modeled contribution to ozone levels is a small fraction of the existing baseline conditions. The overall project ozone impact is considered negligible relative to the baseline.

### Table 4.3-14 Maximum 8-hour Ozone Impact

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Maximum Concentration</th>
<th>Baseline Concentration</th>
<th>Total Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>8 hours</td>
<td>1.4 ppb</td>
<td>60.0 ppb</td>
<td>61.4 ppb</td>
</tr>
<tr>
<td>Ozone</td>
<td>8 hours</td>
<td>0.003 µg/m³</td>
<td>0.129 µg/m³</td>
<td>0.131 µg/m³</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a

ppb = parts per billion air concentration.

µg/m³ = micrograms per cubic meter.

To evaluate secondary PM2.5 impacts resulting from emissions of secondary PM2.5 precursor emissions, an assessment was performed based on the 2021 MMP emissions inventory. For this inventory, the maximum facility-wide potential emissions of secondary PM2.5 precursor emissions would be 335 tpy of NOX and 7.3 tpy of SO2. This assessment used the same EPA-modeled hypothetical industrial source (number 18 in northern Oregon) for PM2.5 precursor emissions and corresponding PM2.5 maximum impacts.

Results of the analysis of primary and secondary PM2.5 impacts are shown in Table 4.3-15. The PGM industrial source results provided both the primary (as emitted) PM2.5 impacts and secondary PM2.5 impacts that were scaled to represent the 2021 MMP sources. For this analysis, the concentrations of both forms of PM2.5 were added together and combined with the baseline PM2.5 concentration. This comparison indicates that predicted primary and secondary PM2.5 impacts from the 2021 MMP would be about one-third or less of existing background conditions. The overall secondary PM2.5 project impact is considered negligible relative to the baseline.
Table 4.3-15  Primary and Secondary PM$_{2.5}$ Impact

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Max. Primary PM$_{2.5}$ Concentration (µg/m$^3$)</th>
<th>Max. Secondarily-Formed PM$_{2.5}$ Concentration (µg/m$^3$)</th>
<th>Baseline Concentration (µg/m$^3$)</th>
<th>Total PM$_{2.5}$ Impact (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PM$_{2.5}$</td>
<td>Annual</td>
<td>1.1</td>
<td>0.01</td>
<td>3.5</td>
<td>4.7</td>
</tr>
<tr>
<td>Total PM$_{2.5}$</td>
<td>24 hours</td>
<td>2.6</td>
<td>0.15</td>
<td>15.0</td>
<td>17.7</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a

µg/m$^3$ = micrograms per cubic meter.
PM$_{2.5}$ = Particulate matter less than 2.5-micron diameter.

Class II Wilderness Area Plum Visibility Screening Results

Plume visibility modeling is a means of quantifying the ability of a viewer to discern a visible plume from a source and is usually evaluated for an observer at the closest point on the boundary of an area of concern. The model used in this case, VISCREEN, outputs a comparison of two calculated plume parameters to determine the possibility of plume perceptibility by an observer using thresholds based on human visual perception (EPA 1992). The two parameters are Plume Contrast (C) and Color Contrast ($\Delta E$). Plume Contrast is a measure of the difference in the light intensity without regard for color. Color Contrast measures the difference in wavelength of light rather than intensity.

EPA’s guidance for using the VISCREEN model for PSD Class I analyses is intended to provide a conservative, worst-case screening model for plume visibility impacts (EPA 1992). Following EPA's VISCREEN guidance, both daytime (6 a.m. to 6 p.m.) and nighttime (6 p.m. to 6 a.m.) are included in this analysis. Therefore, during the summer, the nighttime hours would include some hours when sunlight illuminates any plume and, conversely, during the shorter wintertime daylight hours, some hours analyzed as daytime would occur after the sun has set.

Perpetua performed a revised VISCREEN analysis in October 2020 which is based on combined NOx, PM, and soot emissions of 8,953 lbs/day. Updates included the addition of non-point and mobile equipment emissions; the background visual range was increased to 270 km and large-diameter particle matter emissions were incorporated. However, there was a slight variation in total emissions from the analysis and those emissions produced by the 2021 MMP. The 2021 MMP is expected to produce a combined emissions of 8,204 lbs/day, approximately an 8 percent reduction. The October 2020 analysis was not redone and is considered conservative.

A summary of the VISCREEN results is provided in Table 4.3-16 for daytime and nighttime hours, and for combinations of terrain or sky background and two solar angles (Forest Service 2019i). These results show the frequency of visible plumes expressed as the highest percentage of time a plume could be visible for a given combination of viewing background and solar angle. Table 4.3-17 provides the magnitude of the visible plumes.
Table 4.3-16  Frequency of Modeled Visible Plumes – Screening Results for FCRNRW

<table>
<thead>
<tr>
<th>Plume Parameter</th>
<th>Background</th>
<th>% Day Hours: 10 Degrees</th>
<th>% Night Hours: 10 Degrees</th>
<th>% Day Hours: 140 Degrees</th>
<th>% Night Hours: 140 Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plume Contrast (C)</td>
<td>Terrain</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Color Contrast (ΔE)</td>
<td>Terrain</td>
<td>0.02</td>
<td>2.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Plume Contrast (C)</td>
<td>Sky</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.38</td>
</tr>
<tr>
<td>Color Contrast (ΔE)</td>
<td>Sky</td>
<td>0</td>
<td>2.3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: (Forest Service 2019i) based on Level 2 VISCREEN modeling (Appendix C of Air Sciences 2021a)

1 The 10-degree solar angle reflects conditions after sunrise (day), and before sunset (night).
2 The 140-degree solar angle reflects mid-day conditions.

C = modeled plume parameter that quantifies overall contrast or light impeded by a plume.

ΔE = modeled plume parameter that reflects the color difference or contrast with viewing background.

Results tabulated combine the stability classes and wind speed conditions that exhibit plume parameters above perceptibility thresholds. Stability classes are not adjusted for elevation difference.

Table 4.3-17  Magnitude of Modeled Visible Plumes – Screening Results for FCRNRW:

<table>
<thead>
<tr>
<th>Plume Parameter</th>
<th>Background</th>
<th>Day: 10 Degrees</th>
<th>Night: 10 Degrees</th>
<th>Day: 140 Degrees</th>
<th>Night: 140 Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plume Contrast (C)</td>
<td>Terrain</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Color Contrast (ΔE)</td>
<td>Terrain</td>
<td>1.0</td>
<td>2.2</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Plume Contrast (C)</td>
<td>Sky</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.3</td>
</tr>
<tr>
<td>Color Contrast (ΔE)</td>
<td>Sky</td>
<td>--</td>
<td>1.9</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Source: (Forest Service 2019i) based on Level 2 VISCREEN modeling (Appendix C of Air Sciences 2021a)

1 The 10-degree solar angle reflects conditions after sunrise (day), and before sunset (night).
2 The 140-degree solar angle reflects mid-day conditions.

C = modeled plume parameter that quantifies overall contrast or light impeded by a plume.

ΔE = modeled plume parameter that reflects the color difference or contrast with viewing background.

Results tabulated combine the stability classes and wind speed conditions that exhibit plume parameters above perceptibility thresholds. Stability classes are not adjusted for elevation difference.

Mercury Deposition Screening Results

Hg emissions can occur from both mine operations and ore processing, as a consequence of the processing methods used, and the naturally occurring Hg content of the ore and overburden material. This section describes the predicted Hg deposition flux rates in the near-field modeled area surrounding the SGP. The analysis combines the impacts of both existing background sources and the SGP sources.

One tool that describes the background effects for Hg deposition is the REMSAD. This model has been implemented by the EPA across the continental 48 states to quantify Hg deposition on a regional basis. The inventory information for this model was gathered between the years 2000 and 2006; therefore, it is likely higher than current emissions levels due to regulatory controls on Hg emissions (e.g., on coal-fired power plants) implemented since 2006, and the trend to replace coal-fired generation with gas-fired units. The sources of Hg deposition used in the EPA REMSAD modeling analysis included sources in the U.S.,
Mexico, and Canada; and contributions from global background deposition from Chemical Transport Model, the Global/Regional Atmospheric Heavy Metals model, and the GEOS-Chem model (EPA 2008).

The EPA REMSAD model was used to estimate the background Hg deposition in the SGP area, and three immediately surrounding hydrographic “sub-basins” that extend approximately 20 to 50 miles (32 to 80 km) from the SGP. Results of the REMSAD include both wet and dry deposition mechanisms. As listed in Table 4.3-18, total annual Hg deposition flux rate in the three hydrographic sub-basins ranges from 12.7 to 13.9 grams per square km per year (g/km²-yr).

An AERMOD screening assessment included the point and fugitive Hg emissions from the SGP that are in the form of elemental, Hg²⁺, and HgP. Gaseous elemental Hg⁰ emission sources at the SGP would be controlled by activated carbon absorbers. A source of bias in the analysis in the use of this screening level modeling approach is that it does not account for recent findings showing the importance of Hg⁰ deposition to plants, and this flux being the largest point of entry for atmospheric Hg into terrestrial environments. Taking these factors into account suggests that total Hg deposition predicted by the model is likely biased low.

The results of the AERMOD screen modeling of Hg deposition based on the 2021 MMP inventory are listed in Table 4.3-18. This analysis indicates a maximum estimated increase in Hg deposition rate of 0.4 percent or less of the existing background rate. However, it should be recognized that this rate underestimates the total Hg deposition, as the mechanism of Hg⁰ flux is not included in the screening model.

The range of increased deposition is less than 5 miles (8 km) from the SGP, covering the area generally east of the SGP Operations Area Boundary (OAB). Outside of this area, Hg deposition contribution due to 2021 MMP sources is estimated to be less than the minimum value that can be quantified by AERMOD. Additional details and mapping of the Hg deposition rates from REMSAD and the AERMOD analysis are provided in the Air Quality Analysis report (Air Sciences 2021a).

Table 4.3-18  SGP Contribution Above Estimated Hg Background

<table>
<thead>
<tr>
<th>Hydrographic Sub-basin</th>
<th>REMSAD Background (g/km²-yr)</th>
<th>AERMOD Screen Results¹ (g/km²-yr)</th>
<th>2021 MMP Contribution to Existing Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SGP area and the sub-basin east of the SGP</td>
<td>13.9</td>
<td>0.056</td>
<td>0.40%</td>
</tr>
<tr>
<td>Sub-basin northeast of the SGP</td>
<td>13.6</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Sub-basin southeast of the SGP</td>
<td>12.7</td>
<td>0</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; EPA 2008

¹ Modeled maximum result is at the SGP Operations Area Boundary; screening results show close to zero deposition at any location beyond 5 miles from the SGP.

g/km²-yr = grams per square kilometer per year
Nitrogen/Sulfur Screening Acid Deposition Analysis

A screening analysis using the AERMOD dispersion model was performed to predict the near-field deposition of nitrogen and sulfur species from NOX and SO2 precursor emissions as estimated in the 2021 MMP inventory. Although AERMOD is not designed to simulate several natural processes that affect chemical deposition (e.g., atmospheric chemical transformations to acid compounds), it was used in this case as a conservative screening tool. The analysis assumed that 100 percent of the alternative emissions of NOX would be completely transformed into NO2, and then HNO3 on release to the atmosphere. This assumed extent of conversion is expected to result in a conservative over-estimation of nitrogen deposition.

The NO2 dry deposition flux estimated by AERMOD was converted to the potentially absorbed nitrogen at the surface by multiplying the predicted NO2 flux by the ratio of nitrogen to NO2 molecular weights (equals 0.304). Similarly, the SO2 dry deposition flux estimated by AERMOD was converted to sulfur by multiplying with the ratio of sulfur to SO2 molecular weights (equals 0.5). For purposes of this analysis, deposition of SO2 was converted to the equivalent amount of SO4.

The resulting range of predicted screening-level nitrogen and sulfur deposition rates at the SGP Operations Area Boundary and at receptors approximately 10 km beyond that boundary are listed in Table 4.3-19 in units of grams per square meter per year (g/m²-yr).

Table 4.3-19  Summary of Predicted Near-Field Nitrogen and Sulfur Deposition Rates

<table>
<thead>
<tr>
<th>Chemical Element</th>
<th>Receptor Locations</th>
<th>Deposition Flux Rate (g/m²-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (N)</td>
<td>OAB</td>
<td>0.00081 – 0.0039</td>
</tr>
<tr>
<td>Nitrogen (N)</td>
<td>10 km from OAB</td>
<td>0.00011 – 0.0098</td>
</tr>
<tr>
<td>Sulfur (S)</td>
<td>OAB</td>
<td>0.00001 – 0.0043</td>
</tr>
<tr>
<td>Sulfur (S)</td>
<td>10 km from OAB</td>
<td>0 – 0.0002</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2018b, 2021a

Stibnite Public Access Route

As previously discussed, the SGP public access route (Figure 1 of Air Sciences 2021a) was excluded from the ambient boundary. However, Perpetua did conduct a NAAQS compliance demonstration by applying 25-m spacing receptors along the public access route which was completed as part of a feasibility assessment. The public access route analysis was evaluated for LOM 6 and 10. Table 4.3-20 illustrates the NAAQS impact results at the public access route through the SGP.
Table 4.3-20  SGP Public Access Route Receptor Results and NAAQS Compliance Demonstration

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Maximum Modeled Conc. (µg/m³)</th>
<th>Baseline Conc. (µg/m³)</th>
<th>Total Impact Conc. (µg/m³)</th>
<th>NAAQS (µg/m³)</th>
<th>NAAQS Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8 hours</td>
<td>201.9</td>
<td>1,110</td>
<td>1,312</td>
<td>10,000</td>
<td>Yes</td>
</tr>
<tr>
<td>CO</td>
<td>1 hour</td>
<td>486.8</td>
<td>1,740</td>
<td>2,227</td>
<td>40,000</td>
<td>Yes</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>39.0</td>
<td>0.9</td>
<td>39.9</td>
<td>100</td>
<td>Yes</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hour</td>
<td>124.4</td>
<td>4.3</td>
<td>128.7</td>
<td>188</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>65.3</td>
<td>37.0</td>
<td>102.3</td>
<td>150</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂,₅</td>
<td>Annual</td>
<td>5.3</td>
<td>3.5</td>
<td>8.8</td>
<td>12</td>
<td>Yes</td>
</tr>
<tr>
<td>PM₂,₅</td>
<td>24 hours</td>
<td>12.2</td>
<td>15.0</td>
<td>27.2</td>
<td>35</td>
<td>Yes</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hour</td>
<td>13.6</td>
<td>12.3</td>
<td>25.9</td>
<td>196</td>
<td>Yes</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>6.0</td>
<td>16.8</td>
<td>22.8</td>
<td>1,300</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Far-Field Analysis

The far-field analysis for regional haze contributions, increment, and chemical deposition was performed for four selected Class I areas: SAWT, SELW, HECA, and CRMO. In addition, four Class II wilderness areas were evaluated in the same manner: FCRNRW (beyond 50 km), GOSPEL, HEMBLD, and the WHTCLD. The nearby Nez Perce Requested Analysis Area also was included in this analysis. The far-field analyses described in this section are based on the 2021 MMP inventory for criteria pollutant emissions.

Additionally, the 2018 modeling report (Air Resources 2018b) conducted far-field NAAQS analysis from 50 km to 300 km. Due to slight differences between the 2018 modeling report and the 2021 MMP a verification analysis was conducted to ensure no significant far-field impact changes.

50-km Ring NAAQS Verification

Additional AERMOD modeling was completed to estimate concentrations at receptors located on a 50-km radius ring around the SGP; the maximum approved range of AERMOD. The 50-km ring modeling was performed for the applicable AQRV pollutant averaging time combinations. The 50-km ring modeling result comparison for 2018 modeling and the 2021 MMP modeling is provided in Table 4.3-21.

Table 4.3-21  50-km Ring AERMOD Results for 2018 Modeling and 2021 MMP

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>2018 Modeling (µg/m³)</th>
<th>2021 MMP (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>0.53</td>
<td>0.50</td>
</tr>
<tr>
<td>PM₂,₅</td>
<td>Annual</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Annual</td>
<td>0.14</td>
<td>0.11</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>0.51</td>
<td>0.57</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Pollutant</td>
<td>Averaging Time</td>
<td>2018 Modeling (µg/m³)</td>
<td>2021 MMP (µg/m³)</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>-----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>SO₂</td>
<td>24 hours</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>0.23</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a

**Table 4.3-21** shows that the 50-km ring results are nearly identical for the 2018 modeling and the 2021 MMP modeling. The 2021 MMP results shown represent the highest concentrations for the two modeled scenarios (LOM 6 and 10).

The 50-km ring AERMOD analysis demonstrates that the 2021 MMP changes are not expected to affect the far-field analysis results, and therefore, the 2018 far-field analyses are representative of the 2021 MMP. **Table 4.3-22** illustrates a summary of the far-field impacts.

**Table 4.3-22  Far-Field Impacts Summary**

<table>
<thead>
<tr>
<th>Pollutant / AQRV</th>
<th>Averaging Time</th>
<th>Class I Impacts (µg/m³)</th>
<th>Class II Impacts (µg/m³)</th>
<th>Class I Visibility 98th Percentile Extinction¹</th>
<th>Class II Visibility 98th Percentile Extinction¹</th>
<th>Class I N, S Deposition g/ha-yr¹</th>
<th>Class II N, S Deposition g/ha-yr¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>0.0101</td>
<td>0.0392</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>Annual</td>
<td>0.0021</td>
<td>0.0082</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>0.0370</td>
<td>0.1272</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Annual</td>
<td>0.0101</td>
<td>0.0394</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>0.1622</td>
<td>0.5628</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>0.0002</td>
<td>0.0009</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SO₂</td>
<td>24 hours</td>
<td>0.0057</td>
<td>0.0179</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>0.0118</td>
<td>0.0529</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Annual</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.1832</td>
<td>4.6284</td>
</tr>
<tr>
<td>Sulfur</td>
<td>Annual</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0.1581</td>
<td>0.7551</td>
</tr>
<tr>
<td>Visibility</td>
<td>Annual</td>
<td>--</td>
<td>--</td>
<td>1.47%</td>
<td>4.84%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Threshold</td>
<td>Variable²</td>
<td>Variable²</td>
<td>5%</td>
<td>N/A³</td>
<td>5</td>
<td>N/A³</td>
<td>N/A³</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a

¹ Maximum results are shown, g/ha-yr = grams per hectare-year
² See **Table 4.3-23**
³ There are no regulatory standards or thresholds to compare to the results provided in these columns.
SILs are defined concentrations of criteria pollutants in the ambient air that are considered inconsequential in comparison to the NAAQS. A project impact shown to be below a SIL can be presumed to not cause or contribute to the violation of a NAAQS. Table 4.3-23 shows the Class I and Class II Area SILs for comparison to the results provided in Table 4.3-22. As shown by these two tables, the far-field impacts of criteria pollutants on Class I and II areas are below the SIL. Table 4.3-22 also shows that the Class I visibility and deposition impacts are below the regulatory thresholds (Air Sciences 2021a).

Table 4.3-23  Class I and Class II Area SIL

<table>
<thead>
<tr>
<th>Pollutant/ AQRV</th>
<th>Averaging Time</th>
<th>Class I SIL (µg/m³)</th>
<th>Class II SIL (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>Annual</td>
<td>0.05</td>
<td>0.3</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hours</td>
<td>0.27</td>
<td>1.2</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Annual</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>SO₂</td>
<td>24 hours</td>
<td>0.2</td>
<td>5</td>
</tr>
<tr>
<td>SO₂</td>
<td>3 hours</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>

Far-Field Evaluation of Regional Haze Impacts

For the analysis of the impairment of atmospheric clarity, or regional haze, maximum 24-hour the 2021 MMP source emissions of SO₂, NOₓ, SO₄, and fine and coarse PM were modeled using CALPUFF for the roster of Class I and Class II wilderness areas of interest. To account for atmospheric chemistry, the MESOPUFF II five-pollutant (SO₂, SO₄, NOₓ, HNO₃, nitrate) conversion scheme was used.

The CALPUFF-ready wind field was evaluated against 15 regional station observational data benchmarks for a span of three calendar years (2015 to 2017) using the MMIFStat statistics program. Because much of the modeling domain is in mountainous terrain the “complex conditions” benchmarks were applied to evaluate whether the CALPUFF datasets were acceptable. These evaluations demonstrated that the meteorological data sets generally met acceptance benchmarks that have been commonly reported for mesoscale model evaluation for air quality modeling (Air Sciences 2018b).

The Class I and Class II wilderness area visibility analysis results are presented in Tables 4.3-24 and 4.3-25, respectively. These results show the modeled 98th percentile highest daily change in extinction parameters in each analyzed area. The net predicted reduction in atmospheric visibility is less than the 5 percent change in extinction threshold that is considered the significance criteria for Class I areas (FLAG 2010). Using the same stringent Class I criteria for the Class II wilderness areas included in this analysis demonstrates that the level of regional haze impact in these areas is predicted to be minor.
Table 4.3-24  Predicted Regional Haze Contributions in Class I Areas due to SGP Sources

<table>
<thead>
<tr>
<th>Class I Areas</th>
<th>98th Percentile 2015</th>
<th>98th Percentile 2016</th>
<th>98th Percentile 2017</th>
<th>Maximum 98th Percentile</th>
<th>Class I Extinction Threshold</th>
<th>Below Threshold (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRMO</td>
<td>0.15%</td>
<td>0.07%</td>
<td>0.09%</td>
<td>0.15%</td>
<td>5%</td>
<td>Yes</td>
</tr>
<tr>
<td>HECA</td>
<td>0.33%</td>
<td>0.24%</td>
<td>0.61%</td>
<td>0.61%</td>
<td>5%</td>
<td>Yes</td>
</tr>
<tr>
<td>SAWT</td>
<td>0.54%</td>
<td>0.36%</td>
<td>0.46%</td>
<td>0.54%</td>
<td>5%</td>
<td>Yes</td>
</tr>
<tr>
<td>SELW</td>
<td>1.29%</td>
<td>1.12%</td>
<td>1.47%</td>
<td>1.47%</td>
<td>5%</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; FLAG 2010
CRMO – Craters of the Moon National Monument.
HECA – Hells Canyon Wilderness.
SAWT – Sawtooth Wilderness.
SELW – Selway-Bitterroot Wilderness.

Table 4.3-25  Predicted Regional Haze Contributions in Class II Area due to SGP Sources

<table>
<thead>
<tr>
<th>Class I Areas</th>
<th>98th Percentile 2015</th>
<th>98th Percentile 2016</th>
<th>98th Percentile 2017</th>
<th>Maximum 98th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEMBLD</td>
<td>0.27%</td>
<td>0.17%</td>
<td>0.22%</td>
<td>0.27%</td>
</tr>
<tr>
<td>GOSPEL</td>
<td>0.77%</td>
<td>0.95%</td>
<td>2.08%</td>
<td>2.08%</td>
</tr>
<tr>
<td>NPRAA</td>
<td>1.87%</td>
<td>1.50%</td>
<td>2.63%</td>
<td>2.63%</td>
</tr>
<tr>
<td>FCRNRW</td>
<td>3.54%</td>
<td>4.84%</td>
<td>4.70%</td>
<td>4.84%</td>
</tr>
<tr>
<td>WHTCLD</td>
<td>0.39%</td>
<td>0.26%</td>
<td>0.34%</td>
<td>0.39%</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; FLAG 2010
HEMBLD = Hemingway-Boulders Wilderness.
GOSPEL = Gospel-Hump Wilderness.
NPRAA = Nez Perce Requested Analysis Area.
FCRNRW = Frank Church-River of No Return Wilderness, area beyond 50 km from SGP Operations Area Boundary
WHTCLD = Cecil D. Andrus-White Cloud Wilderness.

Far-Field Nitrogen and Sulfur Deposition

Total potential annual N and S deposition from SGP sources was determined through the same model, CALPUFF, used to assess regional haze effects. The total potential N and S depositions were assumed to be composed only of the N or S component of the different compounds included in the model. Both dry and wet deposition modes were considered. The maximum pollutant emission rates for the ModPro inventory were applied to modeling for three meteorological data years, 2015 through 2017.

Predicted deposition impacts, in grams of pollutant per hectare per year, were compared to the Deposition Analysis Thresholds (DAT) as outlined in the 2011 interagency guidance on N and S deposition as an indicator of significance (NPS 2011). The DAT for N and S in the Class I area are listed as 5 grams per hectare per year (g/ha-yr).

For the three modeled years of 2015 through 2017, the maximum predicted annual deposition rates were below the DAT in each Class I and Class II area evaluated. The estimated maximum N and S deposition in g/ha-yr for the Class I areas evaluated for this analysis are provided in Tables 4.3-26 and 4.3-27.
Predicted deposition rate in SELW is the highest, with N deposition rate of 1.13 g/ha-yr at the highest receptor location. This is well below the DAT of 5 g/ha-yr and indicates that deposition impacts from the SGP in Class I areas would likely be undetectable.

### Table 4.3-26 Summary of Predicted Nitrogen Deposition Rates in Class I Areas due to SGP Sources

<table>
<thead>
<tr>
<th>Class I Area</th>
<th>Max. Receptor N Deposition Rate 2015 (g/ha-yr)</th>
<th>Max. Receptor N Deposition Rate 2016 (g/ha-yr)</th>
<th>Max. Receptor N Deposition Rate 2017 (g/ha-yr)</th>
<th>3-Year Maximum N Deposition Rate (g/ha-yr)</th>
<th>Class I DAT (g/ha-yr)</th>
<th>Below Threshold (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRMO</td>
<td>0.06</td>
<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>HECA</td>
<td>0.21</td>
<td>0.13</td>
<td>0.09</td>
<td>0.21</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>SAWT</td>
<td>0.44</td>
<td>0.44</td>
<td>0.48</td>
<td>0.48</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>SELW</td>
<td>1.00</td>
<td>0.99</td>
<td>1.18</td>
<td>1.18</td>
<td>5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; NPS 2011

\*g/ha-yr = grams per hectare per year.\* DAT = Deposition Analysis Threshold.

Similarly, the estimated maximum N and S deposition in g/ha-yr for the four Class II areas and closest Tribal lands evaluated for this analysis are provided in Tables 4.3-28 and 4.3-29.

Predicted deposition rate in FCRNRW is the highest, with N deposition rate of 4.63 g/ha-yr at the highest receptor location. This reflects the position of the FCRNRW as the closest area of concern, essentially adjacent to the SGP area. Despite the proximity to the SGP, the highest deposition rate contribution is still predicted to be below the protective Class I DAT of 5 g/ha-yr.
Table 4.3-28  Summary of Predicted Nitrogen Deposition Rates in Class II Wilderness Areas and Nez Perce Requested Analysis Area

<table>
<thead>
<tr>
<th>Class II Wilderness Area</th>
<th>Max. Receptor N Deposition Rate 2015 (g/ha-yr)</th>
<th>Max. Receptor N Deposition Rate 2016 (g/ha-yr)</th>
<th>Max. Receptor N Deposition Rate 2017 (g/ha-yr)</th>
<th>3-Year Maximum N Deposition Rate (g/ha-yr)</th>
<th>Class I DAT (g/ha-yr)</th>
<th>Below Threshold (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEMBLD</td>
<td>0.25</td>
<td>0.19</td>
<td>0.18</td>
<td>0.25</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>GOSPEL</td>
<td>0.98</td>
<td>0.90</td>
<td>0.81</td>
<td>0.98</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>NPRAA</td>
<td>1.35</td>
<td>1.07</td>
<td>1.00</td>
<td>1.35</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>FCRNRW</td>
<td>3.20</td>
<td>3.20</td>
<td>4.63</td>
<td>4.63</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>WHTCLD</td>
<td>0.40</td>
<td>0.53</td>
<td>0.33</td>
<td>0.53</td>
<td>5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; NPS 2011

g/ha-yr = grams per hectare per year.
DAT = Deposition Analysis Threshold.

Table 4.3-29  Summary of Predicted Sulfur Deposition Rates in Class II Wilderness Areas and Nez Perce Requested Analysis Area

<table>
<thead>
<tr>
<th>Class II Wilderness Area</th>
<th>Max. Receptor S Deposition Rate 2015 (g/ha-yr)</th>
<th>Max. Receptor S Deposition Rate 2016 (g/ha-yr)</th>
<th>Max. Receptor S Deposition Rate 2017 (g/ha-yr)</th>
<th>3-Year Maximum S Deposition Rate (g/ha-yr)</th>
<th>Class I DAT (g/ha-yr)</th>
<th>Below Threshold (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEMBLD</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>GOSPEL</td>
<td>0.10</td>
<td>0.08</td>
<td>0.07</td>
<td>0.10</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>NPRAA</td>
<td>0.14</td>
<td>0.09</td>
<td>0.07</td>
<td>0.14</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>FCRNRW</td>
<td>0.40</td>
<td>0.39</td>
<td>0.76</td>
<td>0.76</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>WHTCLD</td>
<td>0.04</td>
<td>0.06</td>
<td>0.04</td>
<td>0.06</td>
<td>5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Air Sciences 2021a; NPS 2011

g/ha-yr = grams per hectare per year.
DAT = Deposition Analysis Threshold.

4.3.4.3  Johnson Creek Route Alternative

The Johnson Creek Route Alternative would be used for access during mine construction, operations, and closure and reclamation (the Burntlog Route would not be constructed). The approximately 36-mile Route consists of Johnson Creek Road (CR 10-413) and McCall-Stibnite Road (CR 50-412) from the village of Yellow Pine to the SGP. The road design and maintenance for the Johnson Creek Route would be similar to the road design and maintenance described for the 2021 MMP. Construction material borrow sources would be developed along the Johnson Creek Route ROW. Several changes to water and wildlife habitat management also would be included, but these would only affect air quality impacts during the construction phase.
Controlled public access through the SGP during mine operations would be provided by an access road connecting McCall-Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) through the mine area. Similar to this same feature described under the 2021 MMP, this public access road would be constructed during the first year of mine operation and public access to this road would be carefully controlled; fences would prohibit public visitors on this road from having access to the SGP mining or support activities.

Construction

The Burntlog Route would not be constructed. Using the Johnson Creek Route for mine access would avoid disturbance-related air quality impacts from construction of approximately 20 miles of new road for the Burntlog Route. This would have the effect of decreasing overall roadway construction phase vehicle tailpipe and airborne dust emissions. The topographic features of the route (e.g., a portion of the route is along a river through a canyon) do not affect the nature of the air emissions during construction. However, the location of air pollutant concentrations may differ because construction activities would take place along a different ROW compared to other action alternatives.

No road widening or straightening of curves would be required for the Johnson Creek Road (CR 10-413) portion of the alternative. The Stibnite Road (CR 50-412) portion would be improved by widening curves to accommodate 55-foot semi-truck trailers. Approximately one mile of road past the village of Yellow Pine would be paved. Based on relative roadway length affected, these changes in roadway construction to improve the Johnson Creek Route would represent a decrease of overall construction phase emissions. However, the magnitude of the emissions difference would be small compared to total construction emissions during the first three LOM years. Also, the construction phase emissions for these upgrades to the Johnson Creek Route would be less than the emissions for construction of approximately 20 miles of new road to develop the Burntlog Route under other action alternatives.

This alternative would require an extra 2 years (3 vs 5) for construction of the upgrades to the Johnson Creek Route and the SGP. As a result, operations would start in LOM 6 instead of LOM 4 and the highest impact years for emissions would be LOM 8 and 12 (as compared to LOM 6 and 10 for the 2021 MMP).

Operations

The Johnson Creek Route would be used to access the SGP. The length of this route is approximately 1.5 miles shorter than the Burntlog Route, so that the overall tailpipe emissions for vehicles accessing the SGP would be slightly less for this alternative. The location of ambient air pollutant concentrations due to vehicle traffic would differ, with such effects being located along the Johnson Creek Route.

Providing public access through the SGP reduces the miles of new motorized trails open to all vehicles in the Meadow Creek IRA, and this is expected to reduce net air quality effects due to vehicles traversing the SGP area.

Several air pollution design features proposed by Perpetua are common to both action alternatives and are described in Section 2.4.9. Emission control devices and designs would be put in place to abate emissions of particulate matter, Hg, and criteria pollutant emissions from internal-combustion engines the same as
the 2021 MMP. Operational and reclamation air emission impacts for this alternative would therefore be the same as the 2021 MMP.

The stationary facilities would be designed, constructed, and operated with the same air pollution controls as the 2021 MMP to comply with applicable regulations and any air quality permits issued by IDEQ. The PTC includes stipulations for control of airborne dust from vehicle traffic along the Johnson Creek Route that are based on applicable state and federal regulations, and that are consistent with best available control technology for new surface mining and processing operations.

4.3.5 Mitigation Measures
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous narrative or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Air Quality impacts.

4.3.6 Irreversible and Irretrievable Commitments of Public Resources

4.3.6.1 No Action Alternative
Under the No Action Alternative, the SGP would not be undertaken. Consequently, there would be no change in the current status of air resources in the SGP area, except for the temporary effects of implementing the ASAOC, and irretrievable or irreversible commitments of public resources with respect to air quality would not occur.

4.3.6.2 Action Alternatives
There are no irreversible commitments for air quality resources under the action alternatives. The pollution resulting from action alternatives air emissions would occur over the construction through reclamation phases and then stop. Concentrations of pollutants in the analysis area would rapidly decrease to the ambient conditions then existing in the area. This short-term impact to the air resource would constitute an irretrievable commitment of that resource.

4.3.7 Short-term Uses versus Long-term Productivity

4.3.7.1 No Action Alternative
For the No Action Alternative, the impacts to the air quality resource would be roughly the same as current conditions.

4.3.7.2 Action Alternatives
For the Action Alternatives, operation of the mining and production facilities and associated use of transport vehicles would have continual short-term emissions of air pollutants for the duration of the SGP. These short-term emissions and related air quality impacts have been described.
There are no anticipated long-term effects to productivity related to air quality in the SGP area, after the reclamation of the site. Once the SGP activities cease, air emissions and related effects would no longer occur.

4.4 Climate Change

4.4.1 Impact Definitions and Effects Analysis Indicators and Methodology

The analysis of effects of the SGP on climate change and the effects of climate change in combination with the SGP on the environment include the following issues and indicators:

**Issue:** The SGP activities could contribute to factors that influence climate change.

**Indicators:**

- GHG emissions from SGP activities (construction, operations, and closure and reclamation), expressed as MT of CO$_2$e of GHGs.

**Issue:** Changing climatic conditions, in synergy with the SGP (including construction, operations, and closure and reclamation), could impact physical, biological, and social resources.

**Indicators:**

- Changes in hydrologic patterns (drought, precipitation variability, and seasonality);
- Changes in temperature (extreme heat/cold, or overall change in annual or seasonal temperatures); and
- Changes in extreme weather events (flash flooding, wildfires, severe storms).

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.4.1.1 Emissions, Assumptions, and Uncertainties

As described in Section 3.4, no federal or state rules or regulations currently limit or curtail emissions of GHGs from sources in the State of Idaho. Therefore, no regulatory mechanism currently exists for quantifying a monetized costs and benefits assessment of the significance of the GHG emissions associated with the alternatives.

The CEQ 2016 guidance is again the current policy that individual agencies have the discretion to disclose such an analysis if it would be relevant to the evaluation of alternatives. For purposes of this analysis, qualitative analysis is appropriate because quantifying the relative costs and benefits of the alternatives is not practically feasible and would be subject to high uncertainty as described below. Consequently, a social cost of carbon calculation has not been conducted for this analysis.
Information regarding the recent climatological conditions for Idaho and the Northwest is summarized in Section 3.4. In the same manner, this analysis will qualitatively describe the type and extent of potential climate change impacts on the physical, social, and biological resources in the analysis area since information is not available to address such effects with quantitative certainty.

There is a degree of uncertainty in the GHG emission rate estimates developed using emission factor methodology. This type of uncertainty is discussed in the SGP Air Quality Specialist Report (Forest Service 2022a), Air Emission Inventory Methodology, in relation to the nature of emission factors and emission models representing an average from a population of specific type of emission sources.

4.4.1.2 Mining and Ore Processing GHG Sources

Surface mining activities release GHG to the atmosphere primarily due to the operation of engine-driven vehicles and equipment. For the action alternatives, the largest source category would be operation of diesel-fueled vehicles and equipment engines. Gasoline-fueled vehicles also would be GHG emission sources, as would propane-fueled process heating and heating of buildings. However, these latter two sources each would account for less than 10 percent of fuel consumption, by volume, compared to the total use of diesel fuel.

4.4.1.3 GHG Emission Factors

An overall assessment of GHG emissions for the alternatives can be based on the total fuel consumption as estimated for non-road equipment and mobile sources. Under the action alternatives, the required equipment would be fueled with conventional, low-sulfur No. 2 distillate diesel fuel. In addition, there would be gasoline vehicles, propane-fired heaters, and a propane-fired limestone kiln. The EPA provides generic GHG emissions factors that can be applied to the non-road vehicles and other fuel-combustion equipment (EPA 2015). The factors used for this analysis are listed in Table 4.4-1.

Table 4.4-1 Fuel-Combustion Source Emission Factors

<table>
<thead>
<tr>
<th>Emission Source Category</th>
<th>Carbon Dioxide (CO₂) (kg/MMBtu)</th>
<th>Methane (CH₄) (kg/MMBtu)</th>
<th>Nitrous Oxide (N₂O) (kg/MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationary/Mobile Combustion Units - Propane Fuel¹</td>
<td>62.87</td>
<td>3.00E-03</td>
<td>6.00E-04</td>
</tr>
<tr>
<td>Stationary/Mobile Combustion Units - Diesel Fuel¹</td>
<td>73.96</td>
<td>3.00E-03</td>
<td>6.00E-04</td>
</tr>
<tr>
<td>Motor Gasoline¹</td>
<td>70.22</td>
<td>3.00E-03</td>
<td>6.00E-04</td>
</tr>
</tbody>
</table>

¹Kg – kilogram; MMBtu – Million British Thermal units
¹Source: 40 CFR Part 98 Table C-1 and C-2
4.4.2 Direct and Indirect Effects

4.4.2.1 No Action Alternative

Under the No Action Alternative, the analysis area would continue to be impacted by current climate change trends. The No Action Alternative represents the baseline condition against which potential GHG emission and climate change effects are evaluated for the analysis area. The Forest Service would not approve the mining plan that would allow development of the SGP, ore processing, and related activities. For example, the earth-moving and vehicle traffic that would represent direct GHG emission effects associated with the action alternatives would not occur. The use of petroleum fuels for existing generators, water pumps, vehicles and other approved exploration-related operations would be ongoing, as well as other Forest Service and local activities such as prescribed fires and road construction and use. Mineral exploration would continue to occur as part of the Golden Meadows Exploration Project, creating emissions from fuel consumption and fugitive dust emissions associated with exploration activities; however, the magnitude of impacts from these activities would be very low compared to the action alternatives. Consequently, on a regional level the effects of GHG emissions from activities within the analysis area would be unchanged from current conditions.

In January Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining wastes. There would be GHG emissions related to the construction equipment and vehicles used to access the site. This work is planned to occur between 2022 and 2024.

**GHG Emissions**

If the SGP does not proceed, it can be assumed that current uses by Perpetua and other users on patented mine/mill site claims and on the PNF and BNF would continue to comply with all existing applicable air quality regulations. Uses of NFS lands that may result in GHG emissions include mineral exploration, dispersed OHV use, snowmobiling, recreational driving, and other forms of recreation.

No long-term direct effects on GHG emissions or climate change are anticipated for the No Action Alternative. The removal of existing vegetation that would be necessary to develop the action alternatives would not occur, and the disturbed areas due to historic mining would not be reclaimed or actively reforested. Emissions of GHGs associated with the continuation of approved exploration and ASAOC activities at the SGP and associated reclamation and monitoring commitments would be small and intermittent across a limited area within the Operations Area Boundary. Given these characteristics of the No Action Alternative, GHG emissions would not be expected to change compared to current conditions, and an emissions analysis has not been performed.

4.4.2.2 2021 MMP

The following analysis of effects are considered in the overall context of regional and statewide GHG emissions and climate change trends. Additional details of the climate change impact analysis can be
found in the Climate Change Specialist Report (Forest Service 2022b). Several aspects of the context for this analysis include:

1. GHG emission inventory for the State of Idaho (represents a basis for comparison with action alternative GHG emission estimates);

2. GHGs emitted from diesel-fueled and gasoline-fueled engines, and propane combustion for either process needs or heating of buildings, which can be estimated for the action alternatives;

3. How GHG emissions may be mitigated for the action alternatives, given the lack of a regulatory framework for managing and permitting GHG sources; and

4. Observable climate change trends in Idaho and the Northwest region of the U.S., such as increased annual average temperatures, precipitation variability, and decreased snowpack and streamflow.

Climate change effects occur over decades and on a global scale, such that the CEQ considers climate change to be inherently a cumulative issue (CEQ 2016). Guidance provided by the Forest Service has indicated that, “it is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change and therefore determining significant effects of those projects or project alternatives on global climate change cannot be made at any scale” (Forest Service 2009a). On a global scale, climate change is estimated to cause changes in regional temperature cycles, rainfall amounts, and seasonal distribution or precipitation that can result in flooding, droughts, or more frequent and severe heat waves.

**GHG Emissions**

Implementation of the 2021 MMP would result in a total construction, operation, and closure cycle of approximately 20 years, which includes approximately 3 years of initial site treatment of previous disturbance from past mining and redevelopment and construction activities; an estimated 15 years for mining and ore processing activities with continued concurrent reclamation/mitigation; and 5 years for final closure and reclamation work. There also would be several years of follow-up monitoring to ensure the ultimate success of the reclamation work.

**Direct GHG Emissions**

The direct GHG emissions associated with the 2021 MMP would be CO₂, CH₄, and N₂O emitted from the exhaust of diesel engine-driven vehicles and, to a much smaller extent, from other fuel-fired equipment. Mobile sources working at the Operations Area Boundary would include bulldozers, rubber-tired dozers, motor graders, haul trucks, water trucks, and other support equipment. These vehicles and mobile mining equipment would be almost entirely diesel fuel fired, and combustion emissions would contain GHG constituents, predominantly CO₂.
Additional GHG emissions related to vehicle fuel use would contribute smaller amounts of GHGs to the overall direct effects. These activities may produce fuel combustion emissions from heaters, engines, boilers, etc. Blasting explosives also are recognized as a source of GHG emissions, as their use is a form of combustion. The primary explosive would be a mixture of ammonium nitrate and fuel oil.

The associated emissions are broken down into three general categories. The first is construction of the facilities and infrastructure, access roads, and the associated powerlines. Each of these includes stationary and mobile tailpipe fuel combustion sources. Secondly, process emissions are provided which include diesel and propane combustion, autoclaving, and lime kiln operations (converting limestone to lime). The third element is mining associated GHG emissions. Mining emissions are based on non-road and on-road sources. Also note that emissions from commuting traffic and supply/deliveries are included for construction and mine operations. Commuting is broken into two categories. One is from Highway 55 to the SGLF and the other is from the SGLF to the Operations Area Boundary.

An overall estimate of GHG emissions (expressed in CO₂e) for annual operations is provided in Tables 4.4-2a and 4.4-2b. Based on estimated annual use of petroleum fuels for all uses, the total GHG emissions would vary by operational year. Note that processing and mining would begin during LOM 3 as facility infrastructure/powerline construction ends. Processing operations during its first year would be at 88 percent of the expected maximum for all other years. While it is possible that processing may differ similar to mine operations, LOM 4 through LOM 18 are assumed to be identical to the maximum year.

The 2021 MMP includes several design and operational features, such as implementing air emission controls on the ore slurry oxidation and neutralization, gold and silver leaching and carbon adsorption, and gold and silver electrowinning and refining processes, which serve to limit GHG contributions. Additionally, revegetation of disturbance areas also would occur under this alternative.

Although reasonable estimates for GHG emissions may be derived for a specific activity, there is uncertainty in evaluating longer-term emissions levels and the relationship between GHG sources and sinks over a lengthy and uncertain timeframe. Because climate change effects resulting from GHG emissions are global in scale, there is no reliable way to quantify whether or to what extent local GHG emissions contribute to observed regional trends, or the larger global phenomenon. Therefore, meaningful connection of the 2021 MMP GHG emissions to climate change effects at the state, regional, or global level cannot be provided.
### Table 4.4-2a  GHG Emission Estimates LOM 1 through 9

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yr 1 (tpy)</th>
<th>Yr 2 (tpy)</th>
<th>Yr 3 (tpy)</th>
<th>Yr 4 (tpy)</th>
<th>Yr 5 (tpy)</th>
<th>Yr 6 (tpy)</th>
<th>Yr 7 (tpy)</th>
<th>Yr 8 (tpy)</th>
<th>Yr 9 (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off Road Diesel—Mining</td>
<td>0</td>
<td>0</td>
<td>65,431</td>
<td>82,770</td>
<td>81,552</td>
<td>83,520</td>
<td>81,720</td>
<td>77,109</td>
<td>69,450</td>
</tr>
<tr>
<td>On/Off Road Diesel—Construct</td>
<td>74,143</td>
<td>74,143</td>
<td>38,857</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>On/Off Road Diesel—Powerline</td>
<td>18,300</td>
<td>36,600</td>
<td>18,300</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Process—Propane</td>
<td>0</td>
<td>0</td>
<td>25,413</td>
<td>28,878</td>
<td>28,878</td>
<td>28,878</td>
<td>28,878</td>
<td>28,878</td>
<td>28,878</td>
</tr>
<tr>
<td>Process—Diesel</td>
<td>0</td>
<td>0</td>
<td>216</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
</tr>
<tr>
<td>Process—Autoclave</td>
<td>0</td>
<td>0</td>
<td>41,638</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
</tr>
<tr>
<td>Process—Lime Kiln</td>
<td>0</td>
<td>0</td>
<td>26,674</td>
<td>30,311</td>
<td>30,311</td>
<td>30,311</td>
<td>30,311</td>
<td>30,311</td>
<td>30,311</td>
</tr>
<tr>
<td>Gasoline—Commuting</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
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</tr>
<tr>
<td>Total</td>
<td>97,116</td>
<td>115,416</td>
<td>221,201</td>
<td>194,194</td>
<td>192,976</td>
<td>194,944</td>
<td>193,143</td>
<td>188,532</td>
<td>180,874</td>
</tr>
</tbody>
</table>

Approximately 99.9 percent of all processing GHG emissions are CO\(_2\). Similarly, construction, mining and commuting CO\(_2\) emissions comprise approximately 99 percent of the total GHG emissions from those activities.

### Table 4.4-2b  GHG Emission Estimates LOM 10 through 18

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yr 10 (tpy)</th>
<th>Yr 11 (tpy)</th>
<th>Yr 12 (tpy)</th>
<th>Yr 13 (tpy)</th>
<th>Yr 14 (tpy)</th>
<th>Yr 15 (tpy)</th>
<th>Yr 16 (tpy)</th>
<th>Yr 17 (tpy)</th>
<th>Yr 18 (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On/Off Road Diesel—Mining</td>
<td>73,842</td>
<td>67,617</td>
<td>60,367</td>
<td>63,550</td>
<td>62,016</td>
<td>36,037</td>
<td>22,756</td>
<td>20,734</td>
<td>12,424</td>
</tr>
<tr>
<td>On/Off Road Diesel—Construct</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>On/Off Road Diesel—Powerline</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Process—Diesel</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
<td>246</td>
</tr>
<tr>
<td>Process—Autoclave</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
<td>47,316</td>
</tr>
<tr>
<td>Gasoline—Commuting</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
<td>4,673</td>
</tr>
<tr>
<td>Total</td>
<td>185,265</td>
<td>179,040</td>
<td>171,791</td>
<td>174,974</td>
<td>173,440</td>
<td>147,460</td>
<td>134,180</td>
<td>132,158</td>
<td>123,848</td>
</tr>
</tbody>
</table>

Approximately 99.9 percent of all processing GHG emissions are CO\(_2\). Similarly, construction, mining and commuting CO\(_2\) emissions comprise approximately 99 percent of the total GHG emissions from those activities.
Indirect GHG Emissions

Indirect sources of GHG emissions associated with the 2021 MMP are: 1) Access Road Vehicle travel to and from the site; 2) electrical power generated off-site but used on-site; and 3) energy costs for transport and refinement of antimony concentrate.

Access Road Vehicle Travel

The 2021 MMP has the potential to generate ancillary vehicle travel to and from the mine site. This may include workforce traffic such as crew personal vehicles, supply/haulage traffic such as food delivery, trash, and recyclable haulage. The vehicles were determined to be either light or heavy duty. The workforce vehicles are mostly light duty, while other supply vehicles and hauling trucks were considered heavy duty. Light duty vehicle fuel economy was based on a Ford F-350, 14.0 mile per gallon (mpg) and the heavy-duty vehicles assumed 6.5 mpg from the American Transportation research Institute (ATRI 2016).

Annual miles traveled of light duty vehicles is 236,807 and heavy duty is 374,344 (derived from a 37.5 one-way distance along the access road). All vehicles were assumed to operate using diesel fuel. Total diesel gallons consumed was 16,915 for light duty and 57,591 for heavy duty or 74,506 gallons in total. GHG emissions were calculated using diesel factors from 40 CFR 98 Table C-1 for fuel oil #2. The 100-year potential is 835.6 tpy (758 Metric tons) CO₂e. For further details refer to Appendix A of the SGP Air Quality Specialist Report (Forest Service 2022b).

Off-Site Generation Power

Electricity for the SGP would be provided via a transmission line connected to the grid through IPCo. IPCo obtains approximately half its energy from hydropower, which does not emit GHGs. The remaining power is derived from coal-fired power plants, as well as other sources. Between 2010 and 2019, IPCo generated electricity at an average CO₂ emission rate of 848 pounds per megawatt hour (MWh). This rate is 29 percent lower than it was in 2005, and IPCo plans to maintain an emissions intensity of at least 15 to 20 percent below 2005 levels through 2020. Emissions in 2019 were 543 pounds per MWh (IPCo 2019).

The 2021 MMP is estimated to utilize approximately 40 to 50 MWs at full production, which would be equivalent to approximately 394,200 MWh annually (average of 45 MW per year). Therefore, the Alternative would indirectly be responsible for emissions of approximately 0.097MMT of CO₂ annually, using current IPCo emission rates per MWh. However, it should be noted this existing utility source of electricity would not be considered a new source of GHGs.

Emissions from Antimony Transport and Processing

Gold would be refined on-site and poured into doré bars (an alloy of gold and silver). GHG emissions associated with this process are accounted for in the indirect electricity-related emission estimates. However, the antimony-bearing concentrate would be separated and processed off-site. It is unknown at this time where or how the concentrate from the mine would be processed.

Transportation of the antimony concentrate for off-site processing also would result in indirect GHG emissions. Because it is unknown at this time where the concentrate from the mine would be processed,
total GHG estimations associated with the transport of antimony concentrate would be speculative. However, emissions per mile of transport can be estimated to quantify this indicator. The 2021 MMP estimates one truck per day of antimony concentrate hauled from the Operations Area Boundary. About 22.5 pounds (10.2 kg) of CO₂ are produced from burning one gallon of diesel fuel (EPA 2021e), and at the fuel consumption rate of typical on-road haulage trucks, approximately 135 pounds of CO₂ would be generated per mile for each truck.

There is very little information on the energy usage, and GHG emissions, of smelting and refining antimony concentrate. None of the major countries that actively produce antimony (i.e., China, Russia, Bolivia, Tajikistan, Turkey, and Myanmar) report GHG emissions from the process; however, this specialized mining sector is not considered a substantial source of GHG emissions worldwide. GHG emissions from gold smelting have been shown to have electrolytic refining requirements of approximately 325 kilowatt hours per metric ton of gold (Norgate and Haque 2012). Assuming a similar electrolytic refining requirement for the estimated 44,015 MT of antimony concentrate that would be generated at the site, refining antimony would require approximately 14,304,875 kilowatt hours (14,304 MWh). Using IPCo’s CO₂ current emission rate of 543 pounds per MWh, refining all the antimony concentrate could generate an additional 8,940,000 pounds (4,055 MT) of GHG emissions. While this calculation provides an estimate of GHG emissions from electrolytic refining of gold, rather than antimony, it can be used as part of the indicator for overall SGP GHG emissions.

Overall, the SGP direct and indirect GHG emissions would be a negligible and long-term increase in regional GHG emissions.

*Climate Change Impacts to Analysis Area Resources*

Effects of ongoing climate change in the SGP area following implementation of the 2021 MMP would be largely the same as those that would occur regionally and in Idaho without the SGP. Additional information on the potential effects of climate change on the resources of the SGP area can be found in Section 3.4 and in the Climate Change Specialist Report (Forest Service 2022b).

*Geological Resources and Geotechnical Hazards*

Changes in landcover and slope stability (e.g., pit slopes or slopes adjacent to roadways) due to changing climate conditions and SGP activities could exacerbate certain geologic hazards in the analysis area under the 2021 MMP. Changes in landcover and slope stability due to climate change could create conditions that cause more frequent landslides, damaging vegetation and other forest resources. Landslides also could potentially impact surface water resources through increased sedimentation and runoff.

*Air Quality*

The 2021 MMP would require obtaining an air quality permit from IDEQ and implementing various air quality controls that would likely have the associated benefit of reducing GHG emissions compared to uncontrolled conditions. The sources affected would include surface mining, fugitive dust from off-highway trucks, and process emissions. Additional SGP environmental design measures would be adopted to reduce air quality impacts that would also reduce GHG emissions. An example is busing and/or vanpooling that would be provided to minimize traffic, which also would reduce dust emissions, sediment runoff, and GHGs from vehicle tailpipes.
These EDFs would tend to reduce particulate matter emissions that otherwise could be higher as a result of climate change. One example is disposal of thickened tailings that would form a hardened crust at the TSF at the mine site (Midas Gold 2016a). This method would limit the potential for wind erosion and fugitive dust as climate change affects local winds, precipitation, and temperature. “Smart grid” technology also would be used to reduce energy consumption and emissions of GHGs due to lower power use at the Operations Area Boundary. Additionally, selection of road construction materials and application of natural and chemical dust suppressants would limit the potential for roadway dust emissions as climate change affects local precipitation and temperature. These processes and controls would help to reduce impacts to air quality as a result of climate change during construction and operation of the 2021 MMP; however, increased particulate matter and other criteria pollutants as a result of climate change (e.g., potential for increased wildfires and decreased groundcover resulting in more particulates in the air) could persist within the SGP area (Jacob and Winner 2009).

Soils and Reclamation Cover Materials

The 2021 MMP would include reclamation of existing impacted soils in the Operations Area Boundary. Much of this soil is currently poor quality (for example, old tailings piles), and would be unlikely to naturally revegetate at a normal rate. Proposed improvements to soil as part of preparing the soil for reclamation activities under this Alternative, such as increasing fines and the addition of organic carbon, could allow the soil to retain more moisture during the summer, even as climate change is expected to reduce summer precipitation (Halofsky et al. 2018; Runkle et al. 2017).

Reclamation would help reduce the climate-induced impacts to soils in the short term; however, changes in soil moisture and temperature due to climate change could lead to changes in soil properties and functions, potentially diminishing the soil quality over time (Halofsky et al. 2018). Consequently, diminished soil quality could hinder reclamation efforts involving revegetation of disturbed areas in the Operations Area Boundary.

Hazardous Materials

Under the 2021 MMP, various materials and chemical reagents, including fuel, explosives, and ore processing reagents, would be transported for use at the Operations Area Boundary. Although proposed handling procedures would minimize the risk and likelihood of a spill, climate change could potentially affect the severity of a spill. Climate-change related trends with respect to annual periods of frozen ground, variability in the groundwater tables, increased precipitation and flooding would all factor into potential changes of spill severity.

Surface Water and Groundwater (Quality and Quantity)

Water would be required for ore processing, surface and underground exploration, dust control, and potable or domestic use under the 2021 MMP.

Regional climate change could affect the ability of Operations Area Boundary streams to maintain previous flow rates and recharge of water supply due to changes in Idaho snowpack and precipitation patterns (Halofsky et al. 2018). The ore processing facility would represent the primary consumer of water associated with mine operations and approximately 80 percent of this water would be continually recycled. This practice would improve resiliency of water availability and would help reduce adverse
effects from changes in regional streamflow by maintaining instream flows and protecting aquatic species and downstream uses. Impacts to local stream flows from the 2021 MMP could be altered by the simultaneous effects of climate change on the same streams. For example, it is predicted that natural winter flows could slightly increase while spring and summer flows could decrease under the effects of climate change (Halofsky et al. 2018). The effects of these natural changes cannot be accurately quantified.

A portion of the water supply for the SGP would come from fresh water pumped from groundwater dewatering wells around the Hangar Flats pit in the Meadow Creek drainage and around the Yellow Pine pit in the East Fork SFSR. Groundwater in central Idaho is recharged by precipitation and snowmelt, and reductions in the longevity of snowpack and variable precipitation may lead to faster runoff and less groundwater recharge (Halofsky et al. 2018). Climate change impacts to groundwater could decrease the availability of groundwater and the groundwater quality in the area, which could be exacerbated by construction and operation activities. Climate change induced changes in precipitation and evaporation could also impact the overall site-wide water balance which could result in significant changes to the amount of water being treated and discharged.

Vegetation: General Vegetation Communities, Botanical Resources, and Non-Native Plants

Construction activities under the 2021 MMP would require removal of vegetation that can be naturally impacted by wildfire and spread of insects and disease in a changing climate (Keane et al. 2017). As an ongoing component of the operational phase, and later closure and reclamation, the 2021 MMP would involve revegetating areas disturbed by mining, construction, and operation activities in the Operations Area Boundary.

Revegetation efforts would likely represent an improvement over areas of existing poor-quality soils; however, revegetation of the disturbed SGP and legacy impacted areas could be more difficult due to current trends for climate change. Longer periods of precipitation deficit in the summer paired with decreasing snowpack could create new challenges for vegetation ecosystems (Halofsky et al. 2018). Long-term reclamation may require adaptive revegetation strategies as initial revegetation plans may be challenging due to changing climate conditions and land use requirements (Stanturf et al. 2014). Possible future changes in weather patterns, precipitation amounts and seasonality, and resilience of species to fire and drought would be considered when identifying reclamation methods and goals.

Wetlands and Riparian Resources

Final closure and reclamation of the SGP, conducted under an agency-approved Reclamation and Closure Plan, would reestablish wetlands impacted by the 2021 MMP during construction and operation where feasible and practical. Depending on the type of wetland and adjacent environmental conditions, certain wetlands in the Operations Area Boundary may be able to recover rapidly from construction and operation-related impacts and would likely be the least affected by longer-term climate change. However, some wetlands with narrower environmental tolerances, or those that take longer to reestablish and stabilize, would be vulnerable to additional impacts from long-term climate change trends such as lower streamflows and less groundwater recharge (Halofsky et al. 2018).
Fish Resources and Fish Habitat

Fish habitat would be reconstructed, and shade improvement measures incorporated as part of the reclamation phase, which may mitigate some expected climate change impacts, such as warmer water temperatures and reduced stream flows. The SGP area could experience natural climate change impacts to fish resources and fish habitat by lowering streamflows, increased water temperatures, and decreased water quality which would adversely impact aquatic species and habitat. Process and design modifications, such as rerouting Hennessy Creek, lining the Meadow Creek diversion channel, piping low flows, and the complete backfill of Hangar Flats pit that would improve streamflow and temperature in Meadow Creek, would help to reduce these impacts.

Wildlife and Wildlife Habitat

Climate change impacts to wildlife and wildlife habitat in the SGP area would include habitat loss and fragmentation, physiological sensitivities, and alterations in the timing of seasonal life cycles. Habitat loss and fragmentation may occur in the region and analysis area due to the increased potential for wildfire that is anticipated from changing climatic conditions (Halofsky et al. 2018). Construction and operation of the SGP, access roads, utilities, and off-site facilities would additionally impact wildlife from habitat loss and fragmentation. Reclamation activities are intended to achieve post-mining land use for wildlife habitat as reasonably possible, which would help to reclaim habitat connectivity. However, some displacement and habitat fragmentation would be a long-term effect.

Timber Resources

Timber resources in the SGP area are vulnerable to climate change impacts from changing temperatures and precipitation patterns, increased wildfire frequency and intensity, and insects and disease. Direct effects of climate change on timber (e.g., temperature and precipitation) are likely to be minor, but indirect effects from various disturbances (e.g., increased temperatures and warmer winters causing insect and disease outbreaks) may be significant for the timber industry (Halofsky et al. 2018).

The 2021 MMP would result in ground disturbance in locations currently covered by forested vegetation. Post-closure, disturbed areas would be revegetated. To address losses of vegetation from disturbance, the Reclamation and Closure Plan (Tetra Tech 2021a) proposes to replant with conifer and other tree species, which would be located completely within the Operations Area Boundary. The success of the reclamation could be impacted due to the increased risk to timber from wildfire, insects, and disease due to climate change (American Forests 2017; Halofsky et al. 2018).

Land Use and Land Management

The 2021 MMP would alter land use in areas of new or expanded right-of-way and easements to accommodate access roads, utilities, and off-site facilities. Climate change could also impact how lands in the SGP area are used in the long term, altering the surrounding environment (e.g., decreasing ground cover, larger wildfire burn areas, decreased stream flows impacting how the area is used for recreational or tribal purposes) and impacting accessibility. Land management effects caused by the SGP are not expected to be noticeably impacted by climate change.
Access and Transportation

Access to and through the Operations Area Boundary would be maintained during construction, operation, and closure and reclamation. There would be public access through the Operations Area Boundary during construction and operations via a new gravel road constructed to connect Stibnite Road to Thunder Mountain Road. Climatic changes causing an increase in severe events, such as floods, landslides, and avalanches, can add stress to roadways and other infrastructure, which may result in more frequent maintenance and repairs.

Heritage Resources and Tribal Rights and Interests

The 2021 MMP could impact historic properties, due to ground and visual disturbance in the SGP area. Changing climatic conditions are expected to exacerbate the damage and loss of heritage resources and natural areas utilized by tribes for activities such as hunting, fishing, and gathering in the SGP area through increased soil erosion, more frequent and intense wildfires, flooding, degraded water quality, and wildlife and fish habitat impacts.

Public Health and Safety

Climate change impacts to public health and safety would be experienced through impacts to air, soil, and water quality. The 2021 MMP has the potential to impact public health and safety through the transportation and use of fuels and chemicals, natural environmental hazards, economic impacts, changes to public services and infrastructure, and impacts to the local population.

Climate change could exacerbate some impacts to public health and safety by affecting the way potential hazardous material spills enter the environment. It also could increase the frequency and amplify the impacts of natural hazards such as avalanches and landslides, flash floods, and wildfires (Halofsky et al. 2018). More extreme heat days and higher temperatures over time could increase air quality and health risks over both the short and long term, impacting the public and the employees’ abilities to work (Runkle et al. 2017).

Recreation

Much of the SGP area is used for recreation year-round, which would be both directly and indirectly impacted by climate change. The 2021 MMP has the potential to impact recreational access, recreation facilities, dispersed recreation areas, special use permits, recreational motorized travel, and recreation use. Direct impacts from climate change would include variable precipitation and rising temperatures, which could affect individual decisions to recreate in a certain area. Indirect impacts from climate change would be experienced through the changing conditions that may alter the recreation facilities, opportunities, and setting.

Changing climatic conditions could alter the ecological conditions that affect the quality of the recreation experience, including warmer water temperatures, decreased streamflow, and habitat loss and fragmentation. In the Rocky Mountain region, it is expected that snow-based activities (skiing, snowmobiling) would be impacted negatively by climate change due to warmer winters (Halofsky et al. 2018). Primitive area use, horseback riding on trails, motorized water activities, birding, hunting, and fishing in the region also are expected to be negatively influenced by climate change; however, longer
periods of warmer temperatures are expected to increase participation in warm-weather activities such as water recreation and hiking (Askew and Bowker 2018).

Scenic Resources

The 2021 MMP would impact scenic resources in the SGP area through construction and operation of new facilities and roads. Because much of the SGP area vegetation has been burned by past wildfires, the visual impacts of these new facilities would be amplified as there are less trees to block views. The Forest Service would be consulted for concurrence with VQOs to reduce visual contrast of structures and surfaces; however, if changing climate conditions continue to increase the frequency and intensity of wildfires, more vegetation in the SGP area could be lost, creating greater visibility of the SGP and associated impacts to scenic resources.

Social and Economic Conditions

Socioeconomic impacts are predominantly associated with the development and operations of the SGP and off-site facilities. Although warmer temperatures due to climate change could increase participation in some recreation activities, many other recreation activities could be negatively impacted by climate change. Mine site construction and operations could help support the local communities and offset potential adverse climate change impacts.

Environmental Justice

The 2021 MMP has the potential to impact Native American communities by restricting their access to traditional hunting, gathering, and fishing lands and/or impacting the quality or availability of traditional resources. Changing climate conditions could exacerbate the impacts felt by these communities as warmer water temperatures, decreased streamflow, and habitat loss and fragmentation continue to impact the natural resources in the SGP area.

Special Designations

Variable precipitation, decreased streamflow, and more precipitation falling as rain instead of snow could impact the characteristics and quality of special designation areas. The 2021 MMP would be constructed adjacent to or within wilderness areas, eligible WSRs, IRAs, and RNAs. This would impact wildlife, wildlife habitat, and wilderness characteristics by fragmenting habitat, bringing noise and light disturbance to previously undisturbed areas, and increasing the potential for non-native invasive plant species, pathogens, or insects to spread to these areas. Climate change may add impacts to special designation areas by contributing to habitat fragmentation, magnifying the potential for insects and disease to spread, or hindering the ability for native vegetation to reestablish as disturbed areas are revegetated during reclamation efforts.

4.4.2.3 Johnson Creek Route Alternative

Under this Alternative, the Johnson Creek Route would be used for access to the Operations Area Boundary during mine construction, operations, and closure and reclamation. The Burntlog Route would not be constructed under this Alternative, which avoids the construction GHG emissions for this activity; however, there would be construction activities required to improve the Johnson Creek Route specifically along Johnson Creek Road (CR 10-413) and the Stibnite portion of the McCall-Stibnite Road (CR 50-
412). Controlled public access through the Operations Area Boundary during mine operations for the
Johnson Creek Route Alternative would be provided by a road connecting Stibnite Road (CR 50-412) to
Thunder Mountain Road (FR 50375), the same as the 2021 MMP.

Similar to the 2021 MMP, the SGP under the Johnson Creek Route Alternative also would provide
potential opportunities to affect the severity of local GHG and climate change impacts.

**GHG Emissions**

The Johnson Creek Route Alternative would have the effect of decreasing overall construction phase
GHG emissions; however, the construction activities to complete major improvements on the Johnson
Creek Route would likely offset the decrease and would likely end up very similar to the 2021 MMP. The
magnitude of the GHG emissions difference between the access road alternatives would be small
compared to total SGP construction emissions during the construction phase.

For this alternative, controlled public access through the Operations Area Boundary would be provided
the same as the 2021 MMP. The public access road would be constructed during the first year of mine
operation, with resultant slight increase in GHG emissions for that aspect of the construction phase.

**Climate Change Impacts to SGP Area Resources**

The anticipated climate change impacts for the Johnson Creek Route Alternative would be the same as
those discussed under the 2021 MMP for the following resources: geologic resources and geotechnical
hazards, air quality, soils and reclamation cover materials, hazardous materials, groundwater (quality and
quantity), timber resources, land use and land management, access and transportation, heritage resources,
public health and safety, scenic resources, social and economic conditions, recreation, environmental
justice, and tribal rights and interests. Impacts to surface water (quality and quantity), wetlands and
riparian resources, vegetation (including general vegetation communities, botanical resources, and non-
native plants), fish resources and fish habitat, wildlife and wildlife habitat, and special designations under
the Johnson Creek Route Alternative are described below.

**Wetlands and Riparian Resources**

Although the impacts of climate change would generally be the same as the 2021 MMP, the severity of
impacts to wetlands and riparian resources would be less for the Johnson Creek Route Alternative
compared to the Burntlog Route.

**Vegetation: General Vegetation Communities, Botanical Resources, and Non-Native Plants; Fish
Resources and Fish Habitat; Wildlife and Wildlife Habitat; and Special Designations**

The Burntlog Route would not be constructed under the Johnson Creek Route Alternative, avoiding the
construction of approximately 20 miles of new roadway. Although the impacts of climate change would
be the same as 2021 MMP, it is expected that not constructing the Burntlog Route would help to reduce
the severity of impacts to proposed-threatened plant species (whitebark pine), federally listed fish species,
wildlife and wildlife habitat, and IRAs.
4.4.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous narrative or to reduce uncertainty regarding the forecasting of impacts into the future. At this time, no mitigation measures have been identified for Climate Change impacts.

4.4.4 Irreversible and Irretrievable Commitments of Public Resources

4.4.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not be implemented. The GHGs associated with the SGP would not be produced. There would be no irreversible and irretrievable commitment of resources that contribute to climate change from the SGP.

4.4.4.2 Action Alternatives

Either action alternative would result in an increase in the use of fuels and other resources (40 to 50 MWs of electrical power) in the region; this would result in additional GHG emissions.

The SGP would be expected to have negligible impacts to irreversible and irretrievable commitments on climate change.

4.4.5 Short-term Uses versus Long-term Productivity

4.4.5.1 No Action Alternative

Under the No Action Alternative, the SGP would not be implemented. The long-term productivity of the analysis area would not be impacted by short-term uses, and current climate change trends would continue to persist in the analysis area.

4.4.5.2 Action Alternatives

The operation of either action alternative generates short-term emissions of GHG for the duration of construction, operation, and closure and reclamation of the SGP. The long-term productivity of the SGP area would be an economic benefit to Idaho. Elements of the action alternatives, including reclamation of some historically disturbed areas, also may be a long-term benefit. These improvements in the long-term productivity of the SGP may help to reduce the severity of climate change impacts resulting from warmer temperatures, variable precipitation, decreased snowpack, lower stream flows, warmer stream temperatures, and changes in wildfire patterns.

4.5 Soils and Reclamation Cover Material

4.5.1 Impact Definitions and Effects Analysis Indicators and Methodology

The analysis of effects to soils and RCM includes the following issues and indicators:

Issue: The SGP may result in long-term adverse impacts to soil resources.
Indicators:

- Acres and proportion of the TSRC activity area that are converted from a productive site to a non-productive site (as defined in the both the Payette Forest Plan and Boise Forest Plan).
- Acres and proportion of DD activity area that have altered soil characteristics resulting in a loss of productivity and altered soil-hydrologic conditions (as defined in both the Payette and Boise Forest Plans).

Issue: Available RCM may not be of sufficient quantity or quality to achieve reclamation objectives of returning disturbed areas to productive conditions that sustain long-term wildlife, fisheries, land, and water resources, as defined in the Reclamation and Closure Plan (Tetra Tech 2021a).

Indicators:

- Volume of RCM available for reclamation compared to expected demand to achieve reclamation objectives.
- Quality and suitability of RCM available for reclamation.

The assessment of potential effects is organized and analyzed for each alternative by the three main issue and indicator topics: TSRC, DD, and RCM. The definition and application of these three indicator topics in this analysis is defined as follows:

- TSRC: As defined in the Payette Forest Plan (Forest Service 2003a) and Boise Forest Plan (Forest Service 2010a), TSRC is the conversion of a productive site to an essentially non-productive site for a period of more than 50 years. Mining excavations and dumps, roads, dedicated trails, parking lots, and other dedicated facilities (e.g., landfills, borrow sites, surface water management features, etc.) are examples of TSRC. Proposed activities that may affect soil resources are required to meet PNF Standard SWST03 which states:
  1. In an activity area where existing conditions of TSRC are below 5 percent of the area, management activities shall leave the area in a condition of 5 percent or less TSRC following completion of the activities.
  2. In an activity area where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation and reclamation so that TSRC levels are moved back toward 5 percent or less following completion of the activities.
  3. To estimate TSRC it is essential that the glossary definitions for “activity area, detrimental soil disturbance and total soil resource commitment” are clearly understood.

Effects are determined for a defined "activity area", which for TSRC is “an all-inclusive area where effects to soil commitment could occur or are occurring” (Payette Forest Plan 2003 and Boise Forest Plan 2010). The Forest Plans further describe activity areas as “the smallest logical land area where the effect that is being analyzed or monitored is expected to occur.” The activity area for TSRC has been defined as the NFS lands within the sixth field Hydrologic Unit Codes within which the SGP takes place. The sixth level classification of these units, subwatersheds, was selected as it is a reasonable extent to which some
of the potential indirect effects of the SGP might extend, such as soil erosion and sedimentation. The activity area excludes private lands per established methodology for TSRC analysis on the PNF, which in the case of the SGP is Perpetua’s patented mining claims. The activity area also excludes from the TSRC analysis IRAs, RNAs, and Wilderness because these areas of NFS lands typically do not meet the “expected to occur” criteria for TSRC analysis. However, it should be noted that the SGP proposes certain facilities with portions that would occur within IRAs. Thus, the TSRC activity areas specific to each of the two action alternatives retain the footprints of those portions of facilities that occur within IRAs for the purpose of TSRC analysis. The TSRC analysis includes a determination of existing conditions of TSRC and anticipated post-SGP conditions within the activity area. Two separate activity areas are analyzed based on Forest Plan jurisdiction: one for the PNF subwatersheds and one for the BNF subwatersheds (Figure 3.5-1).

The SGP, the Burntlog Route and access roads, and off-site facilities are all dedicated facilities and are therefore assessed for TSRC and not DD. DD does apply to vegetation clearing for new and upgraded utility corridors in areas that are available for multiple uses on Forest Service lands. DD is represented by any or all these characteristics: Soil Displacement, Soil Compaction, Soil Puddling, and Severely Burned Soil. Effects are determined for a defined activity area, which is the specific area where proposed actions may have detrimental soil impacts. The activity area for DD has been defined as the new and upgraded transmission line corridor where it occurs on NFS lands. A DD analysis includes a determination of existing conditions of DD and anticipated post-SGP conditions within the activity area.

RCM: The discussion of volume of available RCM is based largely from the soil salvageability calculations from the Reclamation and Closure Plan and the stated commitments made by Perpetua for salvage and creation of growth media through composting (Tetra Tech 2019a). The assessment of quality and suitability of the available RCM focuses on the primary site-specific challenges for reclamation that are associated with low organic matter, high rock content, and background metals concentrations of the soils, as well as challenges with long-term stockpiling of RCM. Note that the information in this discussion with respect to metals concentrations in soils is strictly limited to plant growth and issues of phytotoxicity; consideration of ecological effects of elevated metals concentrations is presented in the Fish Resources and Fish Habitat, and the Wildlife and Wildlife Habitat specialist reports (Forest Service 2022i, 2022j), and consideration of human health risks is presented in Section 4.18.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.5.2 Direct and Indirect Effects

4.5.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua, and soil resources would continue to be affected by currently permitted Perpetua drilling activities for exploration under the Golden Meadow Exploration Plan. Consequently, there would be little change in the current status of soil resource conditions at the SGP other than natural erosive and soil formation processes.

Past mining activities have resulted in long-term impacts to soils, and past cleanup/remediation projects have attempted to mitigate some of those mining impacts. Under the No Action Alternative, existing
impacts would remain as developed roads, on existing waste piles (historic development rock and tailings), and at other past mining related locations (Tetra Tech 2019a). It is not anticipated that soils in most of these areas would recover naturally.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015b). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the SGP. The continuation of approved exploration activities at the SGP by Perpetua would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip. Perpetua would be required to continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA.

In January 2021, Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining wastes. Following these construction activities, the disturbed areas would be reclaimed with growth medium and revegetated to stabilize the sites in concert with the Reclamation and Closure Plan developed by Perpetua for the SGP. This work is planned to occur between 2022 and 2024.

4.5.2.2 2021 MMP

Total Soil Resource Commitment

The analysis of environmental consequences associated with soils includes two specific terms from the PNF and BNF Forest Plans: TSRC and DD. TSRC is required to be measured across an all-inclusive area, and not just within a proposed disturbance footprint.

Payette National Forest

The 2021 MMP would occur within three subwatersheds in the PNF, totaling approximately 45,356 acres: Headwaters East Fork SFSR (approximately 15,974 acres); Sugar Creek (approximately 11,497 acres); and No Man’s Creek-East Fork SFSR (approximately 17,885 acres). These three subwatersheds would contain the entire 2021 MMP and portions of the Burntlog Route and new transmission line corridor. The TSRC activity area for the PNF (i.e., excluding IRAs, RNAs, Wilderness, and Perpetua’s private patented mining claims) and existing conditions of TSRC within this activity area is provided in Table 3.5-3 and Figure 3.5-1.

An additional 511 acres of SGP-related disturbance would occur within the private patented mining claims (excluded from the TSRC activity area) of which approximately 381 acres would occur over existing soil disturbance.
Construction of the various facilities, structures, infrastructure, and water management features at the 2021 MMP would result in the removal of native soils that results in TSRC. The majority of construction, mining production, and closure activities would involve excavation, grading, and/or filling of the existing soils that would reduce or eliminate soil productivity. Various portions of the SGP would be affected at different times during the life of the mine. The portion of Burntlog Route within this activity area consists of its approach into the SGP from Thunder Mountain Road (FR 50375) down into and along the East Fork SFSR drainage, including two borrow source areas along the approach. TSRC associated with construction activities for this portion of Burntlog Route would include cut and fill, culvert installation, and retaining walls. The portion of the new transmission line corridor within this activity area consists of its approach into the SGP from Horse Heaven/Powerline Road (FR 416W) and NFST 233 (no name) along the ridge north of the Meadow Creek drainage down into the central portion of the SGP near confluence of Meadow Creek and East Fork SFSR. TSRC would be associated with structure work areas, transmission line access roads, laydown yards, pulling and tensioning sites, and access roads for the one cell tower location.

The 2021 MMP consists of a 3-year construction period, approximately 12-year production period, 5-year closure period, and 5-year plus post-closure period. All the SGP-related disturbance at the mine site would be subject to reclamation activities, with the exception of approximately 278 acres associated with the Hangar Flats high walls, the West End pit lake and high walls, Yellow Pine pit high walls, the Stibnite Lake feature, plus the Midnight, West End, and Plant Site ponds. These areas would remain a permanent commitment of soil resources (a large portion of which would occur on private patented mining claims). For all other areas in the activity area, disturbance would be subject to the reclamation activities detailed in the Reclamation and Closure Plan (Tetra Tech 2019a, 2021a).

Achieving persistent vegetation cover and slope stabilization also would benefit soil amelioration processes. However, the rate of recovery of soil productivity would vary greatly based on the quality and quantity of the RCMs, and site characteristics including slope position, shape and gradient, aspect; elevation, parent materials, seed and propagule sources, and other considerations. As a general rule, the processes responsible for restoration of soil productivity occur over a very long timeframe (centuries to millennia) and do not directly correlate to successful reclamation, which is mainly oriented to short-term objectives. The short timeframe for achievable reclamation measures (e.g., 5 to 10 years) would not be sufficient to establish trends in soil resources and productivity that would take many centuries to millennia to develop within the conditions that pertain to the activity area, especially with respect to the short growing season and harsh winters. Important measures of long-term soil productivity would include: development of a litter layer, biotic crust and/or A horizon (organic matter-enriched surface layer); development of soil structure to support water and air movement; physical and chemical weathering of coarse fragments to add soil fines and nutrients; and development of the soil food web, nutrient cycles, and microbial community, especially the mycorrhizal network. Thus, the recovery of greater than 40 percent soil productivity within a 50-year timeframe is unlikely (Forest Service 2022c).

Reclamation challenges associated with mine facilities are consistent with observations of nearby, previously reclaimed mining areas having mixed vegetative cover success (e.g., Dewey Mine/Thunder Mountain Mining District), as well as previous efforts by Perpetua and others at the SGP to establish a self-sustaining cover of vegetation on previously mined lands that were met with limited success (Greystone 1994). To conservatively address uncertainty in reclamation success, this analysis of TSRC
assumes that all SGP-related disturbances in the PNF activity area would be considered TSRC due to the site-specific challenges and the duration and nature of soil disturbance to support the mining activities.

SGP-related TSRC within the PNF activity area under the 2021 MMP would total approximately 1,302 acres, with approximately 104 of these acres occurring over areas of existing TSRC (e.g., existing roads and trails, past mining disturbance, etc.). Adding the remaining 155 acres of existing TSRC within the activity area that do not overlap with the disturbance associated with the 2021 MMP, the total area of committed soil resources would be approximately 1,457 acres, or approximately 17 percent of the activity area (Table 4.5-1 and Figure 4.5-1).

It should be noted an additional 511 acres of SGP-related disturbance would occur within areas excluded from the activity area (associated with Perpetua’s private patented mining claims) of which approximately 381 acres would occur over existing soil disturbance (Table 4.5-1).

Table 4.5-1 2021 MMP Total Soil Resource Commitment

<table>
<thead>
<tr>
<th>National Forest</th>
<th>TSRC的一致性</th>
<th>Activity Area¹ (acres)</th>
<th>TSRC within Activity Area (acres)</th>
<th>Overall TSRC in Activity Area (acres)²</th>
<th>Percent TSRC in Activity Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payette</td>
<td>Existing TSRC³</td>
<td>7,468</td>
<td>259</td>
<td>259</td>
<td>3%</td>
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<td>Payette</td>
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<td>1,457</td>
<td>17%</td>
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<tr>
<td>Boise</td>
<td>Existing TSRC³</td>
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<td>904</td>
<td>904</td>
<td>1%</td>
</tr>
<tr>
<td>Boise</td>
<td>TSRC with 2021 MMP</td>
<td>76,387</td>
<td>9,023</td>
<td>1,740</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d updated for 2021 MMP activity
¹ Activity area differences between Existing TSRC and TSRC with 2021 MMP are due to the addition of the footprints of 2021 MMP facilities that would occur within IRAs.
² 155 (PNF) 838 (BNF) acres of existing TSRC outside of the disturbance footprint is TSRC that is within the activity area (affecting the percent TSRC) but is not overlapped by or attributed to the SGP. It is included within the “Overall TSRC in Activity Area” column.
³ 2021 MMP overlaps approximately 66 acres of existing TSRC (which is included in this total). Acreage also incorporates the existing portions of access route including portions of the Burntlog Road that would be subject to upgrades and maintenance.

The magnitude of impacts to soil resources within the PNF activity area includes excavation, grading, or filling of 1,457 acres (approximately 120 acres of which are already disturbed to some degree from historical mining activities or other TSRC), and a net increase of TSRC in the PNF activity area of approximately 1,198 acres (from an existing 259 acres to 1,457 acres).

The duration of impacts would vary by component based on the disturbance and reclamation schedule. Most disturbances would be initiated during the construction or early production phase and continue for a number of years until final reclamation is initiated. A select number of components would be reclaimed concurrently during active mine operations, so that duration of impacts would be lessened. Nevertheless, this analysis assumes recovery of greater than 40 percent soil productivity of natural background within a 50-year timeframe would not occur (due to the nature of disturbance and the conditions at the site) and, therefore, the duration of impacts would be longer-term, well beyond the 50-year threshold. For the TSF and TSF Buttress, where selected development rock would serve as the rooting zone for reclamation-related planting instead of native regolith, recovery of soil productivity to 40 percent of natural background would be on a much longer timescale (e.g., likely centuries to millennia) such that they would
be considered permanent TSRC. Unreclaimed areas associated with the open pits (pit lake and highwalls) also would be permanent TSRC.

Not included in the 2021 MMP TSRC total in Table 4.5-1 are approximately 65 acres associated with new surface exploration pads and temporary roads (no spatial information is available for these pads and roads but they are assumed to be on PNF-administered lands; Tetra Tech 2021a). Adding 65 acres to the overall 1,616 acres of TSRC within the PNF activity area would still result in TSRC as approximately 17 percent of the activity area.

**Boise National Forest**

The 2021 MMP-related TSRC within the BNF differs from the PNF in that the commitment of soil resources would occur along two relatively narrow supporting infrastructure corridors (access and transmission) that traverse numerous subwatersheds. The 2021 MMP would occur within 13 subwatersheds in the BNF, totaling approximately 206,604 acres (Table 4.5-1). These 13 subwatersheds would contain the majority of the Burntlog Route, portions of the new and upgraded transmission line corridor, and the Burntlog Maintenance Facility. The TSRC activity area for the BNF (i.e., excluding IRAs, RNAs, Wilderness, and private land ownership) is comprised of these subwatersheds and totals approximately 76,196 acres. Existing conditions of TSRC within this activity area was estimated to cover approximately 904 acres, or 1 percent (Table 4.5-1 and Figure 3.5-1).

Construction of the Burntlog Route would begin during the first year of the 2021 MMP construction phase. It would not be reclaimed until all final closure/reclamation and related environmental closure monitoring work has been completed at the end of the post-closure phase. During construction, some portions of the existing Burnt Log Road (FR 447) would be abandoned in areas where sharp corners or steep slopes require short new road segments to be constructed. These abandoned road segments would be obliterated as part of the construction process. For reclamation, the new road sections would be obliterated and reclaimed, while the upgrades to existing road portions would be narrowed to their current conditions, and the excess width would be reclaimed. However, due to the improved road layout of certain parts of the upgraded road sections (flatter grades and gentler curves), these improved roadway conditions would remain.

The Forest Service would require road obliteration design features to restore slope contours to the natural slope profile, improve soil productivity, improve soil-water infiltration, and re-establish ground water flow paths and hydrologic function. Obliteration of roads includes creation of erosionally stable slopes by recontouring cut and fill sections to restore slope contours, as well as removing culverts and creating armored stream crossings in their place, roughening disturbed surfaces and seeding all disturbance. As appropriate, water bars or other erosion control structures would be left in place.
Figure 4.5-1
Burntlog Route TSRC Activity Areas and Soil Disturbance
Stibnite Gold Project
Stibnite, ID

Base Layer: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Other Data Sources: Midas Gold; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

5 3 1 0 4 Miles

1 inch = 4 miles when printed at 11x17

Patented mining claims (excluded from TSRC activity area)
Compacted surfaces of reclaimed roads would be scarified, deep-ripped or otherwise left in a roughened condition prior to placement of GM and revegetation. At least 6 inches of GM would be placed over most of the reclamation areas, except where steep slopes (>45 percent) limit the use of equipment. GM placement on the widened road segments would be placed as practical, but this area is not included in the GM salvage and replacement balance calculated for the Burntlog Route. Additionally, the soil nail retaining walls on the cut side would be left in place, with regrading performed to the foot of the wall.

The new and upgraded transmission line corridor and access roads would be constructed during the 3-year SGP construction phase (Mine Years -3 through -1). Soil disturbance associated with upgrading the existing transmission line and construction of the new transmission line would involve laydown yards, pulling and tensioning areas, new access/spur roads, and structure work areas. The construction laydown areas, tensioning areas, and some of the new roads would be reclaimed immediately following construction. Final reclamation of the new transmission line corridor would occur during the post-closure period beginning after Mine Year 15. After final closure of the mine, the upgraded section of transmission line to the Johnson Creek Substation would remain in use by IPCo, so there would be no post-closure reclamation or monitoring requirements for Perpetua. The new transmission line between the Johnson Creek Substation and the SGP would be removed and reclaimed during the closure and reclamation phase. Any remaining access roads or disturbed areas would be recontoured to match surrounding topography, scarified, capped with 6 inches of GM, seeded and mulched. Culverts would be removed, and stream channels in the access road corridor would be excavated to original grades.

The Burntlog Maintenance Facility also would be located within the BNF and would be constructed on approximately 3.5 acres. Interim reclamation at this site would entail seeding slopes and other disturbed areas that would not be actively used for vehicle traffic, equipment, or materials storage. Final reclamation would occur during the closure and reclamation phase and would entail grading to smooth slopes, placement of 6 inches of GM, and reseeding, which may include planting trees.

The same considerations made for the analysis of TSRC on the PNF apply to the access and transmission infrastructure corridors and the off-site facility on the BNF. This analysis of TSRC assumes that all SGP-related disturbances in the BNF activity area would be considered TSRC due to the site-specific challenges and the duration and nature of soil disturbance.

Table 4.5-1 provides an overall summary of TSRC considerations as a proportion of the BNF activity area, which also is depicted in Figure 4.5-1. SGP-related TSRC within the BNF activity area under 2021 MMP would total approximately up to 902 acres, with approximately 66 of these acres occurring over areas of existing TSRC (e.g., existing roads and trails, past borrow sources, etc.). Overall TSRC under 2021 MMP would be approximately 1,740 acres, or 2 percent of the activity area.

As discussed for the PNF, the duration of impacts would be longer-term, well beyond the 50-year threshold. For full bench road construction and road cuts, including soil nail walls and rock cuts, recovery of soil productivity to 40 percent of natural background would be on a much longer timescale (e.g., likely hundreds to thousands of years) such that they would be considered permanent TSRC. Transmission line access roads and structure footings associated with the upgraded transmission line would be retained and used by IPCo after mining ceases, which also would be permanent TSRC. The SGLF (approximately 25 acres) would be located on private land outside of NFS lands, and therefore is not considered in the
analysis of TSRC. However, it should be noted that the post-mining land use for the SGLF site is designated as light industry, where the facility would remain un-reclaimed after mine operations (a permanent commitment of land) and transferred to a third-party for light industrial uses.

The effects of the 2021 MMP on TSRC would be major, localized, and long-term. In the case of pit high walls and pit lakes, effects on TSRC would be permanent.

**Detrimental Disturbance**

DD is measured within the specific area where proposed actions may have detrimental soil impacts but excludes dedicated uses such as roads and mining facilities, which are covered under the TSRC analysis area. Thus, the DD analysis area excludes all the SGP, access roads, and off-site facilities, and focuses only on the transmission line ROW on NFS lands where vegetation clearing could occur. It also should be noted that some of the transmission line ROW would be considered in the TSRC analysis (e.g., access roads, construction laydown, and structure work areas serving the SGP), and thus is encompassed by the TSRC analysis area.

This analysis of DD addresses clearing of vegetation using heavy equipment within the transmission line ROW. Up to 500 acres of the transmission line ROW could be affected by vegetation clearing (Tetra Tech 2019a). This represents the maximum extent of clearing because many areas contain only low shrubs or herbaceous vegetation and would not require clearing. Only tall trees and shrubs would be cleared.

Initial vegetation clearing would occur during the 3-year SGP construction phase (Mine Years -3 through -1). Vegetation management to remove trees or maintain low vegetation height would continue throughout the operations phase. After final closure of the mine, the upgraded section of transmission line up to the Johnson Creek Substation would be retained by IPCo, so there would be no post-closure reclamation or monitoring requirements for Perpetua. Final reclamation of the new transmission line corridor from the Johnson Creek Substation to the SGP would occur during the closure and reclamation phase beginning after Mine Year 15. Reclamation of the cleared transmission line ROW would simply entail letting the vegetation grow back and managing weeds and invasive plant species.

DD resulting from clearing of tall vegetation within the transmission line ROW could occur as a result of equipment operations on steep slopes, uncohesive soils, and/or wet soils. DD could occur where at least 2 inches of the A horizon is removed through impacts of wheeled or tracked equipment or dragging of logs across the site. Detrimental soil compaction and soil puddling/ rutting could occur through equipment use mainly on poorly drained mineral or organic soils. Compaction in deep soil layers would not normally occur without repeated disturbance. Burned areas also may be susceptible to DD where the organic litter layer has been removed. Conditions of DD can potentially reduce soil productivity by reducing soil fertility and aeration, limiting root growth, reducing soil infiltration and permeability, and increasing runoff and soil erosion.

DD within the transmission line ROW would be limited by the fact that clearing would typically only occur within forested areas, which for this analysis are assumed to make up approximately one-third of the ROW. It is estimated that SGP-related vegetation clearing could initially result in DD as high as 16 percent of the ROW. This is the highest Forest Service-modeled average extent of DD based on variables of land type, topography, and harvest season for ground-harvesting in Northern Region forests (Reeves et
al. 2012). However, based on the estimate of forest land within the ROW, proportion of highly erodible soils, the limited extent of forested wetlands, and the infrequency and short duration of ground disturbing impacts, DD would more likely be somewhere between 8 percent and 15 percent. Additionally, the Forest Service and Perpetua have established EDFs designed to minimize DD impacts. Measures that would reduce DD involve soil moisture operability requirements, slope restrictions for ground-based operations, guidelines for skidding (i.e., tree removal within forest) and skid trail construction/use, etc.

The DD activity area is the area within the transmission line ROW that would be subject to vegetation clearing only and is estimated at up to 500 acres. The magnitude of impacts from vegetation clearing potentially include DD, compaction and puddling on a conservative estimate of up to 75 acres (15 percent) within the ROW, which would be further reduced by the Forest Service-required environmental protection measures that target DD.

The duration of impacts from vegetation clearing would be considered moderate, localized and long-term. Disturbance would begin the first year of the construction phase (Mine Year -3) and would continue at least through Mine Year 15. Clearing impacts would continue indefinitely on the upgraded transmission line corridors that would continue to be maintained by IPCo after mining ceases.

Reclamation Cover Materials

Suitable RCM (also referred to as GM) within the Operations Area Boundary would be salvaged for subsequent use in reclamation. The salvaged material would come from the soil O (approximately 28 percent), A and B (approximately 33 percent), and C (approximately 39 percent) horizons. GMSs would be strategically placed and located around the SGP to prevent erosion, disturbance, and/or contamination. Measures would be taken to divert water around the stockpiles, and the stockpiles would be stabilized with an interim seed mix to minimize erosion. Salvaged material from the SGP would be redistributed directly on the disturbed areas of the SGP to the extent possible or stockpiled in designated areas for later use.

The GM balance refers to the volume of suitable soils available for salvage within the disturbance footprint versus the volume of GM needed for replacement to achieve reclamation goals (Tetra Tech 2019a). Volume of GM needed for reclamation of the 2021 MMP is based on specified placement depths which vary according to SGP facility and proposed “root zone” material. The “root zone” refers to the near surface materials underlying the GM layer, either native regolith or waste rock, into which reestablished native plant communities would extend roots for moisture and anchoring.

Depth of GM placement would be dictated by the nature of the root zone material. Reclamation of uplands on the TSF and TSF Buttress would involve placement of 3 feet of suitable waste rock at the surface, on top of which 12 inches of suitable GM would be placed. Reclaimed upland sites over native regolith or C horizon material would only receive 6 inches of GM. Reclaimed wetlands and channel reaches would receive a combined 6 inches of GM and SBM, except for wetlands and channel reaches on the TSF, which would receive 6 inches of GM and 6 inches of SBM (Tetra Tech 2019a).

According to the GM balance calculations in the Reclamation and Closure Plan, a total of approximately 1,658,075 bank cubic yards (BCY) of suitable soils (GM and SBM) would need to be salvaged from the SGP for reclamation. A total of approximately 860,373 BCY of GM, chipped wood blend, and SBM are
available for salvage at the SGP. The GM deficit is thus estimated at approximately 797,702 BCY (Tetra Tech 2021a).

Options being considered by Perpetua for developing additional GM for the SGP include: utilizing materials from off-site borrow areas and supplementing additional salvage of GM through composting.

**Quality and Suitability of Available RCM**

There are three primary challenges associated with the quality and suitability of available RCM for the SGP: (1) the overall relatively poor existing quality of the upland soils (unit mixed typic cryorthents) that make up approximately 62 percent of the salvageable volume at the SGP and Burntlog Route; (2) the long-term stockpiling of material; and (3) the high background concentrations of metals in the soil.

**Quality of Existing Soils**

The quality of RCM would vary based on its source, the best material coming largely from the organic and alluvial soils of the Meadow Creek valley. Most of this material would be used for GM and SBM for wetland restoration. Organic matter and fine and large (coarse) woody debris (critical components to achieve sustainable improvement of soil quality and productivity) are limited at the SGP due to past mining activities in valley bottoms and stand replacement fires. GM used for upland reclamation sites would mostly come from relatively poor upland soils. Overall, the majority of GM used would rate as poor or fair (per suitability criteria), due primarily to texture and coarse fragment content (Tetra Tech 2019a).

Perpetua anticipates that compost (and potentially other soil amendments) would be applied to salvaged GM to improve their suitability. The Reclamation and Closure Plan identifies 10 tons per acre of compost would be incorporated into the top 3 to 6 inches of GM. This small amount of compost is not expected to provide sufficient long-term benefits to the GM that would be important for revegetation. On disturbed areas with greater than 30 percent slope, Perpetua also would apply certified weed-free straw mulch to aid in stabilizing the area and promote revegetation. Mulch would be applied over a roughened seed bed at a rate of about 2,200 pounds per acre. The straw mulch would have a short duration of effectiveness due to its quick rate of decomposition and susceptibility to wind.

The Forest Service would require measures to incorporate coarse woody debris (>3 inches diameter) onto reclaimed lands as evenly distributed as possible in the tonnages and diameters described in the Forest Plan. The objective would be to meet the upper range of tons per acre by PVG or greater with larger-diameter material. Its use in reclamation of forest communities on disturbed sites has been shown to provide numerous long-term benefits, including: improved infiltration and reduced runoff and erosion; regulation of soil temperature and moisture; increased soil organic matter content; creation of microsites for flora and fauna; increase in populations and diversity of microorganisms; and improved nutrient cycling (Kwak et al. 2015).

**Stockpiling**

RCM quality also would vary with the duration and depth of stockpiling, ranging from live-handled material to material that remains in deep stockpiles for 10 or more years. The Reclamation and Closure Plan prioritizes live-handling of GM where possible. However, due to the extended period of operations,
and logistical issues, only about 51,000 BCY out of a total of 1,658,075 BCY needed of GM would be live-handled. The remainder would be stored in deep stockpiles with combined holding capacities of 1.79 million BCYs. These stockpiles would be up to 200 feet tall, and the time between GM salvage and placement would vary greatly between different SGP facilities but could remain in stockpiles for as long as 1 to 42 years with the upper end of the range representing the duration from the initial construction phase until the end of the reclamation phase (Tetra Tech 2021a). Potential adverse effects associated with salvage and stockpiling activities include: Soil compaction and disturbance of soil structure; Loss/oxidation of soil organic matter and reduction in microbial populations; and Increase in bulk density, reduction in nutrient cycling, and loss or reduction of viable propagules and seeds (Strohmayer 1999).

Anaerobic conditions approximately 2 to 3 feet below the surface of the GMSs are anticipated to predominate and would likely lead to a decline in microbial respiration and a shift from an aerobic respiration endpoint of carbon dioxide to an anaerobic endpoint of anhydrous ammonia or, depending on the soil moisture content, nitrogen gas or nitrous oxide. Oxygen may, however, penetrate to a greater depth in stockpiles composed of coarse-textured soils when compared to stockpiles composed of fine-textured soils, thereby slightly reducing the impacts of stockpiling on soil productivities. Regardless, soil productivity within the majority of the GM/SBM mass stored with stockpiles would decline during the time of residence within stockpiles. Anaerobic conditions tend to be more prevalent in deeper and older stockpiles (Harris et al. 1989; Sheoran et al. 2010) and would certainly occur in some of the GMS at the SGP. Although conditions would be expected to improve upon placement of the GM, there is uncertainty as to how long it would take for full recovery of microbial communities, including mycorrhizal communities, nutrient cycling and soil structure that are the basis of soil productivity. Fresquez and Aldon (1984) noted that RCM stored for years has little biological resemblance to the undisturbed surface soil, and the resulting reduction to the fungal genera and microorganisms result in an unstable and unbalanced soil ecosystem. Prolonged storage increases the loss of the bacterial element in soil, and mycorrhizal fungi are often destroyed or reduced. Additionally, salvage and stockpiling of wet soils and organic soils present special problems as these are easily compacted, and organic carbon becomes susceptible to oxidation when these soils dry out.

Perpetua would implement salvage and stockpile measures to minimize the loss of soil productivity within stockpiled GM/SBM, which would include:

- Live-handling of soil, when and where practicable;
- Maximizing the surface area of the stockpile according to GM/SBM volume and stockpile area constraints;
- Using the most recently placed GM/SBM during concurrent reclamation to minimize the length of time GM is stored;
- Conducting soil salvage and storage operations when and where practicable during dry periods; and
- When GM/SBM are removed from the stockpile for reclamation, mixing the upper 2 to 3 feet of the GMSs with the lower, non-rhizosphere stockpiled material.
Despite these measures the storage of GM within deep stockpiles for years would still result in the loss of soil productivity, which would affect the overall quality of this material at the time of placement.

**Suitability of Available RCM (Metals)**

The SGP occurs in an area containing numerous highly mineralized zones, and natural background concentrations of some metals are known to be relatively high in some soils and regolith. In addition, elevated levels of arsenic, antimony, and mercury have been observed in soils contaminated by legacy mine operations (URS 2000a). Some known locations of contamination were cleaned up in the past, but it is possible that additional areas of contamination would be exposed and observed during SGP-related construction and operations. Note that the information in this discussion is strictly limited to plant growth and issues of phytotoxicity with respect to metals concentrations in soils (i.e., arsenic, antimony, and mercury); consideration of ecological effects of elevated metals concentrations are discussed in Forest Service (2022i and 2022j).

Soils near the SGP that exceed the screening-level phytotoxicity criteria do continue to sustain native vegetation. How this would translate to use of similar soils for RCM in reclamation is unknown. Potential phytotoxicity would depend on the natural variability of soils based on geology and other environmental factors, and the natural variability in plant tolerances to each metal and the various forms that the metals occur in.

Recommendations in the Reclamation and Closure Plan’s Development Rock and Tailings Root Zone Suitability Analysis are that “the upper-quartile values be used to assess whether on-site soils could support plant growth and development, therefore Chebyshev’s rule of inequality value for arsenic of 450 ppm would likely provide an upper statistical bound for the concentration in soil that would be expected to support plant growth and development on site.” Using the rule, the upper bound is determined as the mean plus two standard deviations. For antimony this would be 68.33 ppm; for mercury 17.07 ppm. Based on these values in the Development Rock and Tailings Root Zone Suitability Analysis, it appears that over 95 percent of the soil samples would be within the upper bounds for supporting plants (Tetra Tech 2021).

The Reclamation and Closure Plan does not include trace metal concentrations as part of the GM suitability guidelines for plant growth. Metal concentrations in growth media would be screened for comparison to baseline soil concentrations pre-reclamation per Forest Service requirements. Total arsenic concentration is used for the root zone suitability guidelines (material that would underlie the GM). However, the upper limit for suitable root zone material was set at 3,000 ppm, which is much higher than the 450-ppm suggested by Chebyshev’s rule. This is justified in the Reclamation and Closure Plan based on three soil profiles at Hecla reclamation sites, where vegetation was found to occur on sites with up to 3,000 ppm arsenic. This concentration of arsenic is similar to concentrations found in mine waste from the Yellow Pine pit. The root zone material is intended to provide a cap 2 to 3 feet deep of suitable development rock for plant roots above mine tailings and undifferentiated development rock.
Arsenic was identified in the Reclamation and Closure Plan as the primary trace metal of concern in native undisturbed soils as well as mine wastes. The ratio of maximum arsenic concentrations in development rock and tailings to the highest and lowest screening-level criteria was at least 9 to 11 times higher than any other trace metal of concern. A review of the soils and reclamation literature did not provide any readily applicable suitability/screening levels for naturally occurring arsenic in RCM and revegetation of native plant communities, hence, the statistical measure described above was applied. Some studies in reclamation of soils contaminated with arsenic and other trace metals do provide information that could be useful for reclamation of the SGP.

Arsenic found in soils normally forms insoluble complexes with iron, aluminum, and magnesium oxides found in soil surfaces. This form of arsenic is relatively immobile and not bioavailable to plants (Nejad et al. 2017). However, certain conditions can cause arsenic to become mobile, typically relating to differences in reducing conditions, pH, sulfide concentrations, temperature, salinity, and soil biota. Arsenic that is in solution becomes available for plant uptake, primarily by roots, which can lead to accumulation of phytotoxic levels. Conditions for arsenic mobility would not be prevalent in site soils but localized variability, especially in arsenic-bearing sulfide concentrations, introduces uncertainty into forecasts of how arsenic will react in RCM locally. Planned screening of soils for arsenic content would reduce this uncertainty.

The use of phosphate fertilizers has been known to induce arsenic solubility in soils (Kilgour et al. 2008; Peryea 1991). This phenomenon has been observed in lead arsenate-contaminated soils and others that have been amended with ammonium phosphate. The released arsenic becomes available for uptake by plants, and phytotoxicity has been observed, even after multiple wetting and drying cycles. The use of chemical fertilizers is a proposed activity identified in the Reclamation and Closure Plan and Perpetua has identified some measures to limit the transport and exposure to soil-borne arsenic (e.g., surface water runoff routed to sediment basins, erosion-, sediment-, and dust-control BMPs, etc.).

Overall, the naturally high background levels of trace metals at the SGP represents a challenge with regards to the suitability of RCM and reclamation-related revegetation efforts. The 3,000-ppm arsenic limit for suitable root zone material is high (and much higher than the mean plus 2 standard deviations for soil samples taken). However, in addition to the root zone limits, the Forest Service also would require limits on the GM (that would overlay the root zone material) for arsenic, mercury, and antimony based on the range of baseline concentrations in site soils (Section 3.5.4.7) and would require a Sampling and Analysis Plan that would include in-situ screening of soils as well as laboratory testing.
4.5.2.3 Johnson Creek Route Alternative

Only impacts that differ from those discussed under the 2021 MMP are discussed in this section.

Total Soil Resource Commitment

Payette National Forest

SGP-related TSRC within the PNF activity area under the Johnson Creek Route Alternative would total approximately 1,260 acres, with approximately 153 of these acres occurring over areas of existing TSRC (e.g., existing roads and trails, past mining disturbance, etc.). Adding the remaining 106 acres of existing TSRC within the activity area that do not overlap with the disturbance associated with the Johnson Creek Route Alternative, the total area of committed soil resources would be approximately 1,366 acres, or approximately 17 percent of the activity area (Table 4.5-2 and Figure 4.5-2). TSRC within the PNF activity area under Johnson Creek Route Alternative would be the same as for the 2021 MMP for SGP-related components but would differ due to use of the Johnson Creek Route instead of the Burntlog Route for SGP access and the public access route through the SGP because of the differences in road disturbance locations.

Table 4.5-2 Johnson Creek Route Alternative Total Soil Resource Commitment

<table>
<thead>
<tr>
<th>National Forest</th>
<th>TSRC</th>
<th>PNF Activity Area1 (acres)</th>
<th>TSRC within Activity Area (acres)</th>
<th>Overall TSRC in Activity Area (acres)2</th>
<th>Percent TSRC in Activity Area</th>
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</thead>
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<td>259</td>
<td>259</td>
<td>3%</td>
</tr>
<tr>
<td>Payette</td>
<td>TSRC with Johnson Creek Route Alternative</td>
<td>7,972</td>
<td>1,2603</td>
<td>1,366</td>
<td>17%</td>
</tr>
<tr>
<td>Boise</td>
<td>Existing TSRC</td>
<td>56,474</td>
<td>716</td>
<td>716</td>
<td>1%</td>
</tr>
<tr>
<td>Boise</td>
<td>TSRC Johnson Creek Route Alternative</td>
<td>56,480</td>
<td>3213</td>
<td>904</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d updated for 2021 MMP activity
1 Activity area differences between Existing TSRC and TSRC with the Johnson Creek Route Alternative are due to the addition of the footprints of the Johnson Creek Route Alternative facilities that would occur within IRAs.
2 106 (PNF) 583 (BNF) acres of existing TSRC outside of the disturbance footprint is TSRC that is within the activity area (affecting the percent TSRC) but is not overlapped by or attributed to the SGP. It is included within the “Overall TSRC in Activity Area” column.
3 The Johnson Creek Route Alternative overlaps approximately 153 (PNF) 133 (BNF) acres of existing TSRC (which is included in this total).

An additional 516 acres of SGP-related disturbance would occur within Perpetua’s private patented mining claims (excluded from the TSRC activity area) of which approximately 382 acres would occur over existing soil disturbance.

Boise National Forest

Under the Johnson Creek Route Alternative, access to the SGP would be provided via the Johnson Creek Route instead of constructing the Burntlog Route. Not constructing the Burntlog Route would reduce the BNF activity area under the Johnson Creek Route Alternative from 13 to 11 subwatersheds, totaling approximately 158,025 acres (Table 4.5-2 and Figure 3.5-1).
Figure 4.5-2
Johnson Creek Route
TSRC Activity Areas and Soil Disturbance
Stibnite Gold Project
Stibnite, ID

LEGEND
- PNF Sub-Watersheds
- BNF Sub-Watersheds
- Other Sub-Watershed
- TSRC Activity Area
- Existing TSRC Area
- Johnson Creek Route TSRC
- IRA and Forest Plan Special Area
- Patented Claims
- Other Features
  - U.S. Forest Service
  - Wilderness
  - Lake/Reservoir

Base Layer: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Other Data Sources: Midas Gold; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 4 miles
when printed at 11x17

Patented mining claims (excluded from TSRC activity area)
Road widening and straightening, along with drainage and bridge improvements, would be required for the Johnson Creek Road (CR 10-579) portion of the Johnson Creek Route. The McCall-Stibnite Road (CR 50-412) portion of the Johnson Creek Route (occurring within the part of No Man’s Creek-East Fork SFSR subwatershed within the BNF) would be improved by straightening curves, constructing retaining walls, and installing culverts. It is likely that most of these improvements would be permanent, and therefore considered permanent TSRC. SGP-related TSRC within the BNF activity area under the Johnson Creek Route Alternative would total approximately 321 acres, with approximately 133 of these acres occurring over areas of existing TSRC (e.g., existing roads and trails, past borrow sources, etc.). Overall TSRC under the Johnson Creek Route Alternative would be approximately 904 acres, or 2 percent of the activity area. Table 4.5-2 provides an overall summary of TSRC considerations as a proportion of the activity area; refer also to Figure 4.5-2.

The effects of the Johnson Creek Route Alternative on TSRC would be major, localized, and long-term. In the case of pit high walls and pit lakes, effects on TSRC would be permanent.

**Reclamation Cover Materials**

Reclamation activities associated with the Johnson Creek Route Alternative would be the same as those in the 2021 MMP for the mine operations area. The amount of GM required for reclamation at the SGP, and the anticipated GM deficit, also would be the same and the same challenges and considerations regarding volume and quality/suitability of available RCM would apply. However, because the Johnson Creek Route Alternative would not include the Burntlog Route, reclamation of the access road would not be required, but any potential GM surpluses from the Burntlog Route would not be available to address the GM deficiency identified at the SGP.

4.5.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and project design features (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Soils and RCM.

4.5.4 Irreversible and Irretrievable Commitments of Public Resources

4.5.4.1 No Action Alternative

Under the No Action Alternative, there would be no open pit mining or removal of legacy waste material at the mine site except for material removed under Phase I of the ASAOC. Consequently, no changes would occur to current soil conditions in the analysis area, and no change to the current commitment of these resources would occur upon reclamation of the ASAOC removal area. Therefore, there would be no additional irreversible or irretrievable commitment of soil resources.

4.5.4.2 Action Alternatives

The un-reclaimed pit lakes and highwalls would be permanent (recovery of soil productivity to 40 percent of natural background would be on a much longer timescale compared to other disturbances) and
represent an irreversible commitment. Other areas such as the reclaimed TSF, TSF Buttress, and road cuts would also have a longer recovery time than other reclaimed areas such as areas of stream and wetland restoration which would receive seedbed material from organic soils and have underlying native regolith and represent an irreversible commitment. Areas of new soil disturbance within the SGP that would not be reclaimed would represent irreversible commitment of the growth media in these areas. Reclaimed areas and the salvage of soil resources for use in reclamation would generally represent an irretrievable commitment of soil resources.

4.5.5 Short-term Uses versus Long-term Productivity

4.5.5.1 No Action Alternative

Under the No Action Alternative, there would be no open pit mining or removal of legacy waste material at the SGP except for material removed under Phase I of the ASAOC. Consequently, no short-term use would occur that would affect soil resources, and no change in long-term productivity would occur.

4.5.5.2 Action Alternatives

The 2021 MMP and Johnson Creek Route Alternative would result in long-term uses of the soil resources for mining purposes. Development of the SGP and associated infrastructure would result in complete removal of native soil horizons in specific locations. A loss of productivity would occur in some soils from compaction, rutting, erosion, and other physical and chemical changes due to the removal of soils for stockpiling and reclamation.

Some residual impacts from legacy mine operations would be reclaimed prior to construction and operation of the Action Alternatives. Most of the proposed disturbance area is anticipated to be reclaimed upon completion of all mine operations. Long-term productivity of growth media that are respread during reclamation of disturbed areas would be less than the native soils, and soil productivity of un-reclaimed SGP disturbance would be reduced to near zero.

4.6 Noise

4.6.1 Impact Definitions and Effects Analysis Indicators and Methodology

The analysis of effects of noise includes the following issue and indicators:

Issue: The SGP construction and operations may cause disturbance to the NSRs described in Section 3.6.

Noise impacts from construction of mine facilities, roads, and the transmission line upgrade, as well as mine operations, mine traffic on haul roads, and mine traffic on area access roads, may affect area residents, recreationists, and wildlife. This section evaluates only SGP noise impacts to humans; refer to Sections 4.12 and 4.13 for noise impacts to fish and wildlife.

Indicators:

- SGP-attributed noise exceeds a threshold of 55 dBA L_{DN} at the exterior use area of an NSR, or 55 dBA L_{EQ1h} at any time at an exterior use area.
• SGP-attributed noise exceeds a threshold of 45 dBA L_{DN} at the interior portion of a residential NSR.
• SGP-attributed noise causes the baseline outdoor ambient noise level to increase by more than 5 dBA in the vicinity of an NSR.
• SGP-attributed noise causes the resulting indoor or outdoor ambient noise level to exceed 60 dBA L_{EQ}.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Predicted increases in outdoor noise levels due to the SGP were calculated at a given sensitive receiver using reference sound levels of typical equipment, with typical acoustical usage factors (i.e., its loudest condition) for each type of equipment (Federal Highway Administration [FHWA] 2006), and baseline ambient noise data. Except where otherwise specified, noise levels were calculated using the noise analysis tool developed by the USDOT, FHWA Roadway Construction Noise Model (RCNM) version 1.1 (FHWA 2006). Traffic noise levels were calculated using the noise analysis guidance provided in the Federal Transit Administration’s (FTA’s) Transit Noise and Vibration Assessment Guidance and blasting noise levels are calculated using guidance provided in Blasting and Explosive Quick Reference Guide (Dyno Nobel 2010). All calculation methods and calculation assumptions are described in detail in the Noise Specialist Report (Forest Service 2022d).

For purposes of this noise analysis, and because the distance between the SGP and the nearest NSR (Figure 3.6-1) is considerably greater than the largest dimension of the area that encompasses the mine pits, backfills, and all facilities associated with the SGP, the entire SGP is represented by a single aggregate acoustical point source that is co-located in the Ore Processing Plant Area (Figure 2.4-2).

4.6.2 Direct and Indirect Effects

4.6.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua, and existing noise from exploration-related activities of the previously approved Golden Meadows Exploration Project (Forest Service 2015b) would continue through reclamation of disturbances. These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the Operations Area Boundary. This includes continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip.

4.6.2.2 2021 MMP

Construction

Noise generated during the construction phase would include noise from SGP construction activities and construction of off-site access roads, utilities, and facilities. Noise levels generated by these activities are
described below, followed by a discussion of noise impacts on identified NSRs. A threshold noise level of 55 dBA is applied to the predicted noise levels to evaluate the environmental impact to humans, fish, and wildlife.

EDFs as presented in Section 2.4.9 would be implemented and have been considered in the analysis of construction noise impacts.

**Operations Area Boundary**

Construction activities at the SGP would require the use of a variety of heavy industrial-type equipment. A complete list of the noise levels for construction equipment that would likely be used at the SGP during the construction phase is provided in the Noise Specialist Report (Forest Service 2022d).

The estimated total average hourly noise levels from the Operations Area Boundary during the construction phase would be 94 dBA L_Eq at the reference distance of 50 feet and would attenuate to the threshold of 55 dBA approximately 0.8 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from the SGP would attenuate to 55 dBA approximately 0.38 miles from the source of activity. Mine development and associated noise during the construction phase would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.). Noise impacts from construction within the Operations Area Boundary would be minor to moderate, short term, and localized.

**Access Roads**

Access roads associated with the SGP include the Johnson Creek Route and Burntlog Route. The Johnson Creek Route is the current summer access from SH 55 via Warm Lake Road. The Burntlog Route includes a combination of existing roads and new road connector segments from SH 55 via Warm Lake Road. For the Burntlog Route, segments of Burnt Log Road and Thunder Mountain Road would be upgraded, and the Burnt Log Road would be extended to connect to Thunder Mountain Road. The evaluation of noise impacts from the access roads includes separate analyses for road construction activities along the Burntlog Route, for SGP-related traffic on both the Johnson Creek Route (during construction for the first 2 years only) and on the Burntlog Route once it is completed, and from borrow areas along the Burntlog Route.

**Road Construction**

Road construction activities along the Burntlog Route would involve upgrading existing roads (Burnt Log Road and Thunder Mountain Road) and constructing a new section of roadway to connect the Burnt Log Road to Thunder Mountain Road. Road construction would include cut and fill; embankment stabilization; laying road base and surfacing material; installing new bridges, drainage channels and culverts; replacing or upgrading existing bridges, culverts, and drainages; and associated activities. Construction activities along the Burntlog Route would be limited to the first year of the construction phase (Mine Year -3, Figure 2.4-3). Construction noise would be short-term, intermittent, and transitory in any one location.
A 5.3-mile segment of the Burntlog Route would be along Riordan Creek, with varying distances to the NSR sites discussed in Section 3.6, and would be the closest segment to the FCRNRW, resulting in the potential for elevated noise levels to extend further into the FCNRNW along this segment.

A complete list of the major noise sources and estimated maximum noise levels on the Burntlog Route during the construction phase is provided in the Noise Specialist Report (Forest Service 2022d). In the absence of a detailed schedule of equipment for road construction, it was assumed that equipment used would be similar to road maintenance mobile equipment detailed for use during the operations phase, along with a dozer, crane, and two haul trucks.

The estimated total average hourly noise levels from construction on the Burntlog Route would be 91 dBA $L_{eq}$ at the reference distance of 50 feet. Noise from access road construction would attenuate to the threshold of 55 dBA approximately 0.57 miles from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from access road construction would attenuate to 55 dBA approximately 0.28 mile from the source of activity. Road construction and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.).

### SGP-Related Traffic During Construction

During the first year of the construction phase, SGP-related traffic volumes on the Johnson Creek Route access roads are estimated at 65 AADT. Heavy vehicles are estimated at 45 AADT and light vehicles at 20 AADT (Midas Gold 2016a, Perpetua 2021a). Vehicles per peak hour were assumed to be 10 percent of AADT (Washington State Department of Transportation 2018). Based on the estimated traffic volumes and vehicle mix, and typical vehicle speeds of 25 mph, estimated average hourly noise levels from SGP-related traffic on the mine access route during the construction phase would be $48 \text{ dBA } L_{eq}$ at 50 feet from the roadway, which is well below the impact threshold level of 55 dBA. Noise impacts from, SGP-related traffic during the first year of the construction phase would be negligible, short-term, and localized.

After construction of the Burntlog Route is completed, SGP-related traffic would move from the Johnson Creek Route to solely the Burntlog Route. SGP-related traffic volumes during this portion of the construction phase are estimated at 68 AADT (48 heavy vehicles and 20 light vehicles; vehicles per hour is assumed to be 10 percent of AADT for peak hour traffic). Estimated average hourly traffic noise levels would be approximately $49 \text{ dBA } L_{eq}$ at 50 feet from the roadway, also below the impact threshold of 55 dBA. Noise impacts from SGP-related traffic on the Burntlog Route during the construction phase would be negligible, short-term, and localized.

### Borrow Areas

The extraction and processing of various types of granular material at borrow sites during the construction phase would require an excavator, loader, and portable rock crusher. A complete list of major noise sources and estimated maximum noise levels for construction equipment that would likely be used at the borrow sites is provided in the Noise Specialist Report (Forest Service 2022d).
The estimated total average hourly noise levels from each borrow site during the construction phase would be 84 dBA $L_{eq}$ at the reference distance of 50 feet. Noise from the borrow sites during construction would attenuate to the threshold of 55 dBA approximately 0.26 mile from the source based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from the borrow sites during construction would attenuate to 55 dBA approximately 0.15 mile from the source of activity. Facilities construction and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.). Noise impacts from borrow areas would be negligible to minor, short-term, and localized.

**Utilities**

Utilities associated with the SGP include transmission lines, substations, and radio and cell phone communications towers. The SGP involves upgrading 63 miles of IPCo’s existing transmission lines from its Lake Fork Substation south of McCall along its existing right-of-way to the Warm Lake Substation to 138 kV and constructing approximately 9 miles of transmission line from the new Johnson Creek substation to the Operations Area Boundary. Transformers would reduce the voltage to 34.9 kV for distribution to facilities within the Operations Area Boundary. The SGP also would involve upgrades to the existing microwave relay tower located atop a 9,000-foot peak to the east of the Operations Area Boundary and installing radio repeaters and cell phone towers at existing communications sites, including the Meadow Creek Lookout, the Thunderbolt Lookout, the new Burntlog Maintenance Facility, and on additional private parcels as needed. Noise impacts associated with utilities would occur primarily during the construction phase. Construction activity associated with the transmission line upgrade and new transmission line construction work is expected to generate the highest noise levels. Substations and communications tower upgrades and construction work is expected to generate lower noise levels; therefore, these are not assessed as separate subcomponents.

Upgrading the existing 63 miles of transmission lines would involve replacing existing utility poles and associated equipment (e.g., transformers, cross arms, guy wires, fuses, switches, insulators, etc.). Tree removal and incidental brush and tree trimming also may be required. Constructing the 9-mile transmission line would involve construction of new permanent and temporary access roads, improvements to existing access roads, removal of danger trees, and the placement of utility poles, conductor, and associated equipment. Helicopters may be used to install utility poles and conductors. Noise associated with all construction activities and construction-related traffic would be short-term, intermittent, and localized, as construction proceeds along the transmission line corridor.

In the absence of a detailed schedule of equipment for utility construction, it was assumed that the equipment used would be similar to other transmission line projects. Further detail on the major noise sources and estimated maximum noise levels for transmission line upgrades and construction are provided in the Noise Specialist Report (Forest Service 2022d).

The estimated total average hourly noise levels for the Lake Fork to Johnson Creek substations transmission line upgrade and Johnson Creek Substation to the SGP transmission line construction would be 84 dBA $L_{eq}$ at the reference distance of 50 feet. Noise from transmission line construction would attenuate to the threshold of 55 dBA approximately 0.28 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from transmission line construction would attenuate to 55 dBA approximately 0.15 mile from the source of activity.
Johnson Creek Substation to the SGP construction may require helicopter use, which would temporarily increase average hourly noise levels up to 100 dBA $L_{EQ}$ for short periods of time. Noise from transmission line construction with helicopter use would attenuate to the threshold of 55 dBA approximately 1.70 miles from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from transmission line construction with helicopter use would attenuate to 55 dBA approximately 0.66 mile from the source of activity.

The estimated total average hourly noise levels from transmission line access road construction or upgrades would be 91 dBA $L_{EQ}$ at the reference distance of 50 feet. Noise from transmission line access road construction would attenuate to the threshold of 55 dBA approximately 0.57 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from access road construction would attenuate to 55 dBA approximately 0.28 mile from the source of activity. The Lake Fork to Johnson Creek substations transmission line upgrade is not expected to include new access road work. Transmission line work and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.).

The relocation of the Cascade Switching station to 1,217 feet from Site 8 affects estimated noise levels at the site. Additionally, approximately one mile east of Cascade includes the Thunder Mountain Estates Bypass as part of the upgraded transmission line, which relocates a 5.4-mile segment of the transmission line to avoid the Thunder Mountain Estates Subdivision.

**Off-Site Facilities**

Off-site facilities associated with the 2021 MMP include the SGLF on Warm Lake Road and the Burntlog Maintenance Facility located along the Burntlog Route, approximately 4.4 miles east of the junction of Johnson Creek Road and Warm Lake Road (midway between Sites 4 and 5).

Construction of the off-site facilities would require the use of a variety of heavy construction equipment, further details of which and estimated maximum noise levels from construction are provided in the Noise Specialist Report (Forest Service 2022d). The estimated total average hourly noise levels from each facility during the construction phase would be 85 dBA $L_{EQ}$ at the reference distance of 50 feet. Noise from facility construction would attenuate to the threshold of 55 dBA approximately 0.67 mile from the source based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from facility construction would attenuate to 55 dBA approximately 0.32 mile from the source of activity. Facilities construction and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.). Noise impacts from the off-site facilities during construction would be minor, short-term, and localized.

**Avalanches**

During construction under the 2021 MMP, size D2, D3, or D4 avalanches to roads hazards are presented in Table 4.6-1. There are no size D5 avalanche paths that exist in the Operations Area Boundary under either alternative.
### Table 4.6-1 Summary of Avalanche Hazards under the 2021 MMP

<table>
<thead>
<tr>
<th>Zone</th>
<th>Miles affected</th>
<th># Paths Affecting Road</th>
<th>Frequency Descriptor</th>
<th>Frequency Range (Years)</th>
<th>Size at Road</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Lake – Landmark</td>
<td>1.6</td>
<td>11</td>
<td>High</td>
<td>1-3</td>
<td>D2-D3</td>
<td>High snowfall area, south facing short slopes produce small (D2) loose avalanches, larger north facing paths can produce mixed flow to D3.</td>
</tr>
<tr>
<td>Landmark – Black Lake</td>
<td>0.5</td>
<td>7</td>
<td>Very Low – Moderate</td>
<td>10-11</td>
<td>D2-D3</td>
<td>Burnt forest with mostly low frequency south facing terrain. Typically, small (D2) loose avalanches.</td>
</tr>
<tr>
<td>Black Lake – Meadow Creek</td>
<td>1.3</td>
<td>13</td>
<td>Low – High</td>
<td>1-30</td>
<td>D2-D3</td>
<td>High frequency D2 and low frequency D3 terrain. The exception is path BKL-7 which will produce frequent D3 avalanches.</td>
</tr>
<tr>
<td>Meadow Creek Ridge</td>
<td>0.2</td>
<td>1</td>
<td>High</td>
<td>1</td>
<td>D2-D3</td>
<td>One path (MCR-1) will produce frequent D2 and infrequent D3 avalanches.</td>
</tr>
<tr>
<td>Stibnite Mine East</td>
<td>0.9</td>
<td>6</td>
<td>Very Low – Moderate</td>
<td>10-100</td>
<td>D2-D3</td>
<td>Very low frequency area, with the exception of SE3.</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>4.5</strong></td>
<td><strong>38</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: DAC 2021

Avalanche risk abatement via explosive methods would be implemented for the SGP. Explosives would be used in higher elevations at the upper portions of the potential avalanche paths to dislodge the avalanche with minimum impact. Noise levels would be affected depending on the choice of explosive used and mechanism of delivery, as shown in Table 4.6-2, and the expected number and frequency of avalanche control measures used are provided in Table 4.6-3.

### Table 4.6-2 Avalanche Control Method Noise Levels

<table>
<thead>
<tr>
<th>Noise Event</th>
<th>Noise Level (dBA) at 100 feet*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gazex explosion</td>
<td>124.0</td>
</tr>
<tr>
<td>2-pound hand charge</td>
<td>107.2</td>
</tr>
<tr>
<td>4-pound hand charge</td>
<td>107.8</td>
</tr>
</tbody>
</table>

Source: DAC 2021
dBA = A-weighted decibels
If not implemented using portable methods, Gazex explosions would involve placing charge installations at control locations during operations and closure.
Table 4.6-3  Expected Number and Frequency of Use of Avalanche Control for Each Access Route Option

<table>
<thead>
<tr>
<th>Road Segment</th>
<th># Targets¹</th>
<th># Targets/ Mission¹,²</th>
<th># Missions/ Year²</th>
<th># Charges/ Year³</th>
<th>Road Total # Charges/Year³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Lake Summit (Warm Lake to Landmark)</td>
<td>23</td>
<td>15</td>
<td>4.0</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Burntlog South (Landmark to Black Lake)</td>
<td>8</td>
<td>7</td>
<td>0.3</td>
<td>2</td>
<td>85</td>
</tr>
<tr>
<td>Burntlog North (Black Lake to Stibnite Mine)</td>
<td>32</td>
<td>24</td>
<td>3.1</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Stibnite Mine (Burntlog Road Segment)</td>
<td>11</td>
<td>8</td>
<td>0.1</td>
<td>1</td>
<td>85</td>
</tr>
<tr>
<td>Johnson Creek Road Landmark to Yellow Pine⁴</td>
<td>26</td>
<td>15</td>
<td>0.3</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>Stibnite Road South (Yellow Pine to Stibnite Mine)³</td>
<td>97</td>
<td>71</td>
<td>1.0</td>
<td>81</td>
<td></td>
</tr>
</tbody>
</table>

Source: DAC 2021

¹Targets (control points) per path that may be used per mission.
²Missions are a function of the frequency estimate. Typically, control frequency was assumed to be three times more frequent than the natural return period of avalanches to the road. The relationship between return period and control frequency was adjusted for some paths.
³Charges are the targets per mission multiplied by missions per year, summed over all the paths on a road segment.
⁴The Johnson Creek Road and Stibnite Road South would be used for site access until completion of the Burntlog Route construction.

The amount of avalanche control needed each winter would vary depending on winter conditions of the year. Based on the Gazex explosive method, the maximum noise level would be 124.0 dBA at 100 feet away (Table 4.6-2), and at 50 feet away, the maximum noise level would be 130.0 dBA. A single blast at 50 feet away causes for a maximum noise level of 144.0 dBA. There are approximately 7.5 missions per year, limiting the amount of avalanche abatement measures to a narrow timeframe of the year, with long-term, minor, and localized impacts. Based on the location of the SGP components (i.e., Operations Area Boundary, access roads) and the avalanche paths investigated, the probability of noise complaints would be expected to be low. The nearest residential areas to a potential avalanche risk abatement measures would be the village of Yellow Pine, a minimum of four miles away from any explosive, and the Warm Lake recreation tract, a minimum of two miles away from any explosive. Additional detail on predicted decibel levels from avalanche control measures are provided in the Noise Specialist Report (Forest Service 2022d).

Noise Impacts

A summary of predicted noise levels at NSR locations during the construction phase under the 2021 MMP is provided in Table 4.6-4, followed by a discussion of source-specific impacts at each NSR.
A threshold noise level of 55 dBA is applied to the predicted noise levels to evaluate the environmental impact to humans. Noise impacts to fish and wildlife are discussed in Sections 4.12 and 4.13, respectively.

**Table 4.6-4  2021 MMP Noise Levels at NSR Locations During Construction**

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA $L_{EQ}$)</th>
<th>Baseline Ambient Noise Level (dBA $L_{DN}$)</th>
<th>SGP-Attributed Daytime Noise Level (dBA $L_{EQ}$)&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SGP-Attributed Day-Night Noise Level (dBA $L_{DN}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>84 / 84&lt;sup&gt;2&lt;/sup&gt;</td>
<td>82 / 82&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>41 / 25</td>
<td>39 / 23</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>52/51&lt;sup&gt;2&lt;/sup&gt;</td>
<td>50/49</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>21 / 21</td>
<td>19 / 19</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>21 / 21</td>
<td>19 / 19</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>51 / 51</td>
<td>49 / 49</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>N/A</td>
<td>51</td>
<td>64 / 64&lt;sup&gt;2&lt;/sup&gt;</td>
<td>62 / 62&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>N/A</td>
<td>50</td>
<td>33 / 6</td>
<td>31 / 4</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/Boise National Forest</td>
<td>N/A</td>
<td>50</td>
<td>63 / 63&lt;sup&gt;2&lt;/sup&gt;</td>
<td>61 / 61&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40</td>
<td>N/A</td>
<td>40 / 31</td>
<td>38 / 29</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

<sup>1</sup>Noise level with SGP-related traffic on Johnson Creek Route/Burntlog Route.

<sup>2</sup>Temporary Short-term exceedance of the recommended noise level, shaded in gray.

N/A = not available.

**Site 2 Miller Residence Adjacent to Johnson Creek Road**

Transmission line upgrade work, including utility access roads in the immediate vicinity, would be the only SGP-related activity that would contribute to the noise environment at Site 2 during the construction phase. Noise from the SGP, access road construction along the Burntlog Route, utility access road construction, off-site buildings, and borrow sites would not contribute to noise levels at Site 2 during the construction phase due to distance. SGP-related traffic on the Johnson Creek Route would generate average hourly noise levels below background ambient levels at the site and would have no effect on noise levels at Site 2.
The closest distance between Site 2 and transmission line work would be 53 feet and noise levels at Site 2 would fall below the 55-dBA impact threshold when transmission line work is approximately 800 feet away. Helicopter use would not be anticipated in this area.

Absent transmission line work, daytime noise levels at Site 2 are estimated to be below existing ambient noise levels during the construction phase. The 2021 MMP would have a negligible, temporary, and localized impact on the noise environment at Site 2 during construction while transmission line work is occurring in the immediate vicinity.

**Site 3 Meadow Creek Lookout**

Construction activity on the Burntlog Route would be the greatest contributor of SGP noise at Site 3 during the construction phase; however, combined noise levels would still be well below the 55-dBA threshold and background ambient noise levels. The 2021 MMP would have a negligible, short-term, and localized impact on the noise environment at Site 3 during construction.

**Site 5 Forest Service Camp at Landmark**

Access road construction on the Burntlog Route, facilities construction at the Burntlog Maintenance Facility, and SGP-related traffic on the Johnson Creek Route would be the greatest contributors of SGP noise at Site 5 during the construction phase. Noise from all SGP-related activities combined would result in a temporary increase in noise levels above the 55-dBA threshold.

SGP-related noise would decrease once construction activity on the Burntlog Route and Burntlog Maintenance Facility is completed and SGP-related traffic moves from the Johnson Creek Route to the Burntlog Route to below the 55 dBA threshold.

The closest distance between Site 5 and the access road is approximately 0.4 mile. When access road work moves approximately 0.5 mile away, noise levels from all SGP-related activities combined would fall to the 55-dBA impact threshold. The 2021 MMP would have a minor, temporary, and localized impact on the noise environment at Site 5 during access road and facilities construction.

**Site 6 Forest Service Summer Camp at Warm Lake**

Transmission line upgrade work is the only SGP-related activity that would contribute to the noise environment at Site 6 during the construction phase; however, daytime noise levels would still be well below the 55-dBA threshold and background ambient noise levels at the site. The 2021 MMP would have a short-term, negligible, and localized impact on the noise environment at Site 6 during construction.

**Site 7 Warm Lake Camp**

Transmission line upgrade work and construction activity on the Burntlog Route are the only SGP-related activities that would contribute to the noise environment at Site 7 during the construction phase; however, combined noise levels would still be well below the 55-dBA threshold and background ambient noise levels at the site. The 2021 MMP would have a negligible, short-term, and localized impact on the noise environment at Site 7 during construction.
Site 8 Granite Excavation Shop in Cascade

Transmission line upgrade work would contribute to the noise environment at Site 8 during the construction phase. The Cascade Switching station would be moved to the west, closer to Site 8. Noise from all other construction activities would not contribute to noise levels at Site 8 during the construction phase due to distance. Estimated noise levels would be well below the 55-dBA threshold and background ambient noise levels at the site. The 2021 MMP would have a negligible, short-term, and localized impact on the noise environment at Site 8 during construction.

Site 9 Southern Pine Plantations Property

Transmission line upgrade work, including utility access roads in the immediate vicinity, and facilities construction at the SGLF are the only activities that would contribute to the noise environment at Site 9 during construction. Noise from all other construction activities would not contribute to noise levels at Site 9 during construction due to distance.

Daytime noise levels at Site 9 would increase when transmission line work is occurring at the closest location along the transmission line but would be lower as the distance increases. The closest distance between transmission line work and Site 9 is 317 feet; when transmission line work is 800 feet away, SGP-related noise levels would fall to 55 dBA. Helicopter use is not anticipated in this area.

Absent transmission line work, noise from facilities construction would attenuate to well below the 55-dBA threshold and background ambient levels during construction.

The 2021 MMP would have a negligible, temporary, and localized impact on the noise environment at Site 9 during construction while transmission line work is occurring in the immediate vicinity.

Site 10 Yellow Pine

SGP-related traffic on the Johnson Creek Route access road would be the greatest contributor of noise at Site 10 during construction. Noise would attenuate to well below the 55-dBA threshold and background ambient noise levels. The 2021 MMP would have a negligible, short-term, and localized impact on the noise environment at Site 10 during construction.

Site 11 Ice Hole Campground in Boise National Forest

Transmission line upgrade work, including utility access roads in the immediate vicinity, and SGP-related traffic on the Johnson Creek Route are the only activities that would contribute to the noise environment at Site 11 during construction. Noise from all other construction activities would not contribute to noise levels at Site 11 during construction due to distance.

Daytime noise levels at Site 11 would increase when work is occurring at the closest location along the transmission line but would be lower as the distance increases. The closest distance between Site 11 and transmission line work is 370 feet; when transmission line work is at approximately 850 feet away, noise levels would fall to below 55 dBA.
Absent transmission line work, noise from SGP-related traffic on the Johnson Creek Route would attenuate to well below the 55-dBA threshold and background ambient levels. The 2021 MMP would have a negligible, temporary, and localized impact on the noise environment at Site 11 during construction while transmission line work is occurring in the immediate vicinity.

**Site 12 Mule Hill Trailhead**

SGP-related noise at Site 12 during the construction phase would be highest during the first year when construction is occurring on the Burntlog Route, with noise from access road construction on the Burntlog Route, the nearest borrow site, and construction in the Operations Area Boundary being the greatest noise contributors during construction. Noise from the transmission line upgrade work and SGP-related traffic on the Johnson Creek Route would not contribute to noise levels at Site 12 during the construction phase due to distance. Combined noise levels would still be well below the 55-dBA threshold and background ambient noise levels at the site. The 2021 MMP would have a negligible to minor, short-term, and localized impact on the noise environment at Site 12 during construction.

**Frank Church-River of No Return Wilderness Areas**

To evaluate potential noise impacts at dispersed recreational resource areas in the FCRNRW east of the Burntlog Route, noise levels from three construction-related scenarios/sources at a range of distances from the roadway were calculated (Table 4.6-4 and Table 4.6-5). Based on sound levels measured at the Meadow Creek Lookout and along Burnt Log Road, ambient sound levels within the FCRNRW are estimated at 40 to 45 dBA L\text{EQ,1h}. The alignment of the 5.3-mile Riordan Creek section of the Burntlog Route would be the closest portion to the FCRNRW, resulting in the potential for elevated noise levels to extend further into the FCRNRW along this segment.

**Table 4.6-5  Estimated Noise Levels with Distance from the Operations Area Boundary the Burntlog Route Construction**

<table>
<thead>
<tr>
<th>Distance from Access Route (feet)</th>
<th>SGP-Attributed Noise Level (dBA L\text{EQ})</th>
<th>SGP Plus Baseline Level(^1) (dBA L\text{EQ})</th>
<th>Increase above Baseline Noise Level(^2) (dBA L\text{EQ})</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>66</td>
<td>66</td>
<td>21-26</td>
</tr>
<tr>
<td>1,000</td>
<td>59</td>
<td>59</td>
<td>14-19</td>
</tr>
<tr>
<td>1,500</td>
<td>55</td>
<td>55</td>
<td>10-15</td>
</tr>
<tr>
<td>2,000</td>
<td>52</td>
<td>52-53</td>
<td>8-12</td>
</tr>
<tr>
<td>4,000</td>
<td>44</td>
<td>45-48</td>
<td>3-5</td>
</tr>
<tr>
<td>8,000</td>
<td>34</td>
<td>41-45</td>
<td>0-1</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

\(^1\) Based on ambient sound levels measured at the Meadow Creek Lookout and along Burnt Log Road, average ambient daytime sound levels within the FCRNRW Area are estimated at 40 to 45 dBA L\text{EQ,1h}.

\(^2\) Reported increase over baseline is increase in combined SGP + baseline over baseline.

Noise levels were calculated at incremental distances of 500 up to 8,000 feet into the area since there are no discrete NSRs identified within the FCRNRW. Complete baseline ambient noise assumptions for the FCRNRW are described in the Noise Specialist Report (Forest Service 2022d). Predicted noise levels
assume line-of-sight noise transmission and do not take into account obstructions of this path due to terrain which would reduce the noise levels from those predicted.

Road construction activities along the Burntlog Route would result in noise level increases within the FCRNRW (Table 4.6-6). roadway construction noise would dominate the noise environment at these distances and would be similar to noise levels in a busy commercial or urban environment. Resulting noise levels approximately 1,500 to 2,000 feet from the roadway would be below the recommended noise level of 55 dBA $L_{EQ1h}$ for outdoor use areas; however, noise increases above ambient sound levels would be readily noticeable to twice as loud, depending upon actual distance. Direct effects on recreationists could include general annoyance or sleep annoyance at campsites in wilderness areas. Indirect effects could include a reduction in the overall quality of the remote wilderness experience.

Overall, the greatest potential noise impacts from road construction would occur where the Burntlog Route closely borders the FCRNRW and would be negligible to minor, temporary, and localized, impacting a discrete area of the FCRNRW.

In the vicinity of the Meadow Creek Lookout, a section of Burnt Log Road closely borders the FCRNRW. To evaluate potential noise impacts at dispersed recreational resource areas in this region of the FCRNRW, noise levels at a range of distances from the roadway also were estimated. SGP-related traffic noise from the Burntlog Route would attenuate to well below the average ambient daytime sound levels within the FCRNRW Area, within 500 feet from the roadway. Further detail on estimated noise levels from all distances from traffic on the Burntlog Route during construction are provided in the Noise Specialist Report (Forest Service 2022d).

Several potential borrow areas are located along the Burntlog Route close to the FCRNRW. To evaluate potential noise impacts at dispersed recreational resource areas in the FCRNRW east of the Burntlog Route and the potential borrow areas, noise levels at a range of distances from the borrow areas also were calculated (Table 4.6-6) and are further detailed in the Noise Specialist Report (Forest Service 2022d).

Table 4.6-6 Estimated Noise Levels from Borrow Areas along the Burntlog Route During Construction

<table>
<thead>
<tr>
<th>Distance from Access Route (feet)</th>
<th>SGP-Related Borrow Area Noise Level (dBA $L_{Aeq}$)</th>
<th>SGP Plus Baseline Level$^1$ (dBA $L_{Aeq}$)</th>
<th>Increase above Ambient Noise Level$^2$ (dBA $L_{Aeq}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>59</td>
<td>59</td>
<td>14-19</td>
</tr>
<tr>
<td>1,000</td>
<td>52</td>
<td>52-53</td>
<td>8-12</td>
</tr>
<tr>
<td>2,000</td>
<td>45</td>
<td>46-48</td>
<td>3-6</td>
</tr>
<tr>
<td>3,000</td>
<td>41</td>
<td>44-46</td>
<td>1-3</td>
</tr>
<tr>
<td>6,000</td>
<td>31</td>
<td>41-45</td>
<td>0-1</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

$^1$Based on ambient sound levels measured at the Meadow Creek Lookout and along Burnt Log Road, average ambient daytime sound levels within the FCRNRW Area are estimated at 40 to 45 dBA $L_{EQ1h}$.

$^2$Reported increase over baseline is increase in combined SGP + baseline over baseline.
Overall, potential noise impacts on recreationists from borrow areas would be limited to a discrete area within approximately 1,000 to 2,000 feet of borrow areas located along the Burntlog Route where it closely borders the adjacent wilderness area, resulting in general annoyance or sleep disturbance at campsites in wilderness areas. Noise from these borrow areas would likely be periodic or intermittent, but ongoing throughout the construction phase, resulting in negligible to minor, short-term, and localized impacts.

**Operations**

Noise generated during the operations phase would include noise from the Operations Area Boundary, in addition to noise from traffic and maintenance activities on the Operations Area Boundary access road, utility operations, and off-site facilities and borrow site operations. Noise levels generated by these activities are described below, followed by a discussion of noise impacts on identified NSRs. A threshold noise level of 55 dBA is applied to the predicted noise levels to evaluate the environmental impact to humans.

EDFs as presented in Section 2.4.9 would be implemented and have been considered in the analysis of operations impacts.

**Operations Area Boundary**

Operations within the Operations Area Boundary would involve development rock and legacy tailings removal, ore mining, materials loading and transport, ore processing and legacy tailings reprocessing, and routine maintenance of mine-site support facilities and infrastructure. Major noise-generating activities would include: the operation of heavy industrial-type earth moving equipment; drilling and blasting activities to extract rock from the ground; materials loading, hauling, and unloading activities; and rock crushing and grinding at the process plant area. The primary rock crusher would be located outside at the process plant area, while rock grinding and other ore processing activities would be located inside a series of buildings. A complete list of noise levels for equipment that would be used within the Operations Area Boundary during the operations phase is provided in the Noise Specialist Report (Forest Service 2022d), with a summary of estimated maximum noise levels provided below.

The estimated total average hourly noise levels, without blasting, from SGP operations within the Operations Area Boundary would be 99 dBA L_{EQ} at the reference distance of 50 feet. Noise would attenuate to the threshold of 55 dBA at approximately 1.5 miles away based on distance alone and not considering terrain effects. Accounting for ground absorption and atmospheric absorption, noise from the SGP would attenuate to 55 dBA approximately 0.60 mile from the source of activity.

During blasting, noise levels could temporarily increase to 102 dBA L_{EQ}. Noise from the SGP with the addition of blasting would attenuate to the threshold of 55 dBA at approximately 2.2 miles based on distance alone and not considering terrain effects. Accounting for ground absorption and atmospheric absorption, noise from the Operations Area Boundary with the addition of blasting would attenuate to 55 dBA at approximately 0.78 mile from the source of activity. Mine operations and associated noise would occur 24 hours per day. Blasting noise would occur intermittently, in daytime, for short periods of time. Noise impacts from operations within the Operations Area Boundary would be moderate to major, long term, and localized.
Access Road

The evaluation of noise impacts from the access roads during the operations phase includes road maintenance and SGP-related traffic along the Burntlog Route.

Road Maintenance

A summary of the major noise sources and estimated maximum noise levels from maintenance on the Burntlog Route is provided below, with a detailed description included in the Noise Specialist Report (Forest Service 2022d).

The estimated total average hourly noise levels from road maintenance activity on the Burntlog Route would range from 88 dBA $L_{\text{eq}}$ at the reference distance of 50 feet during the summer months to 90.2 dBA $L_{\text{eq}}$ during the winter months when snow removal is required. Noise from access road summer maintenance would attenuate to the threshold of 55 dBA at approximately 0.42 miles based on distance alone and noise from access road winter maintenance would attenuate to the threshold of 55 dBA approximately 0.54 mile from the source of activity. Accounting for ground absorption and atmospheric absorption, noise from summer access road maintenance would attenuate to 55 dBA approximately 0.22 mile away and noise from winter access road maintenance would attenuate to 55 dBA approximately 0.27 mile from the source of activity. Access road maintenance and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.). Noise impacts from road maintenance during operations would be minor, long term but intermittent, and localized.

SGP-Related Traffic During Operation

During the operations phase, SGP-related traffic volumes on the Burntlog Route are estimated at 50 AADT. Heavy vehicles are estimated at 33 AADT and light vehicles at 17 AADT between the SGLF and the SGP (Perpetua 2021a). Heavy vehicles are estimated at 25 AADT and light vehicles at 131 AADT between the SH 55 and the SGLF (Perpetua 2021a). Based on the estimated traffic volumes and vehicle mix, and assuming typical vehicle speed of 25 mph and 10 percent of AADT traffic volume at peak hours conditions, estimated average hourly noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA $L_{\text{eq}}$, which is below the threshold of 55 dBA. SGP-related traffic is assumed to be on the Burntlog Route 24 hours per day. Noise impacts from SGP-related traffic during operations would be minor, long-term, and localized from SH 55 to the SGLF and from the SGLF to the SGP on the Burntlog Route.

Borrow Areas

Activity, equipment, and noise levels at borrow areas would be the same as during the construction phase. Noise impacts from borrow areas would be negligible to minor, long-term but intermittent, and localized.

Utilities

The existing transmission lines and substations that would be used to serve the SGP are not new sources of noise within the affected environment. New sources of noise associated with the operation of utilities would be limited to the Johnson Creek substation to the Operations Area Boundary transmission line and new substations. During stormy or very humid weather, audible corona noise from a wetted transmission
line operating at 230 kV or greater can contribute to ambient noise and, under the right conditions and at distances close enough to the conductors, be audible to a listener on the ground. But under such poor weather conditions (e.g., precipitation) that cause corona noise to be more audible, other acoustical contributors to the outdoor ambient sound environment like rainfall on leafy vegetation, road surfaces, and structure surfaces (rooves) also rise in magnitude. Under fair weather conditions, audible corona noise is much less and likely inaudible under most conditions. Hence, audible corona noise from the transmission line operating at 138 kV would likely not increase ambient levels beyond the transmission line right-of-way.

A typical operating substation might be expected to generate combined noise levels (due to on-site transformer hum, cooling fans, etc.) of up to 80 dBA LEQ1h at 3 feet from a geographic acoustical center-point position. Substation noise would attenuate to the 55-dBA threshold approximately 53 feet from the substation. Noise impacts from utilities during operations would be negligible to minor, long-term, and localized.

Off-Site Facilities

Operational noise sources associated with the Burntlog Maintenance Facility and SGLF would generally be limited to vehicles entering and leaving these facilities, and heating, ventilation, and air conditioning equipment associated with facility buildings, but no heavy equipment routinely operating at these facilities. The combined noise generated by these sources would be substantially less than SGP traffic and/or the road maintenance noise for the Operations Area Boundary access road, which would occur along the access roads that these facilities would be located immediately adjacent to. Noise impacts would be negligible to minor, long-term, and localized.

Avalanches

During operations under the 2021 MMP, the same impacts as during construction would be present.

Noise Impacts

Table 4.6-7 provides estimated noise levels at noise receiver locations during the operations phase under the 2021 MMP, followed by a discussion of estimated noise levels and impacts at each NSR.

Table 4.6-7  2021 MMP Noise Levels at NSR Locations During the Operations Phase

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA LEQ)</th>
<th>Baseline Ambient Noise Level (dBA LDN)</th>
<th>SGP-Attributed Daytime Noise Level (dBA LEQ)</th>
<th>SGP-Attributed Day-Night Noise Level (dBA LDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>51 / 51²</td>
<td>49²</td>
</tr>
<tr>
<td>ID</td>
<td>Name</td>
<td>Baseline Ambient Noise Level (dBA $L_{EQ}$)</td>
<td>Baseline Ambient Noise Level (dBA $L_{DN}$)</td>
<td>SGP-Attributed Daytime Noise Level (dBA $L_{EQ}$)</td>
<td>SGP-Attributed Day-Night Noise Level (dBA $L_{DN}$)</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/ Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/ Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>46</td>
<td>44</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>N/A</td>
<td>51</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>N/A</td>
<td>50</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/ Boise National Forest</td>
<td>N/A</td>
<td>50</td>
<td>35</td>
<td>33</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40</td>
<td>N/A</td>
<td>33</td>
<td>31</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

$^1$ Long-term, periodic, or intermittent exceedance of the recommended noise level.

$^2$ Value does not exceed the 55 dBA threshold but does exceed the ambient noise level.

*Site 2 Miller Residence adjacent to Johnson Road*

Average hourly noise from all SGP-related activities combined, both with and without blasting, at Site 2 would have no effect on background ambient noise levels; therefore, there would be no impact on the noise environment at Site 2 during operations.

*Site 3 Meadow Creek Lookout*

Average hourly noise from all SGP-related activities combined, both with and without blasting, at Site 3 would have no effect on the background ambient noise levels. Access road maintenance on the Burntlog Route would be the greatest contributor of SGP noise at Site 3 during operations; however, combined noise levels would still be well below the 55-dBA threshold and background ambient noise levels at the site. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 3 during the operations phase.

*Site 5 Forest Service Camp at Landmark*

In the absence of blasting, access road maintenance on the Burntlog Route is the greatest contributor of SGP-related noise at Site 5 during operations. Average hourly noise from all SGP-related activities combined, both with and without blasting, would attenuate to below the 55-dBA threshold, but well above background ambient noise levels at Site 5.
In the absence of access road maintenance activity, SGP-related noise would attenuate to well below background ambient noise levels. Access road maintenance is expected to be temporary in any single location and intermittent throughout the year, though more frequent during the winter.

The 2021 MMP would have negligible to minor, long-term but periodic, and localized impacts at Site 5 during road maintenance activity throughout operations.

**Site 6 Forest Service Summer Camp at Warm Lake**

Average hourly noise from all SGP-related activities combined, both with and without blasting, would have no effect on background ambient noise levels at Site 6. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 6 during operations.

**Site 7 Warm Lake Camp**

Access road winter maintenance and SGP-related traffic on the Burntlog Route is the only activity that would contribute to the noise environment at Site 7 during operations; however, average hourly noise from all SGP-related activities combined, both with and without blasting, would attenuate to well below the 55-dBA threshold and background ambient noise levels. The portion of the road influencing Site 7 is currently used and plowed under existing conditions; the only additional SGP-related noise source would be up to 50 AADT using the access road. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 7 during operations.

**Site 8 Granite Excavation Shop in Cascade**

Substation noise is the only SGP-related noise that would contribute to the noise environment at Site 8 during operations. The Cascade Switching station would be 1,242 feet away from Site 8; however, average hourly noise from all SGP-related activities combined, both with and without blasting, would have no effect on background ambient noise levels at Site 8 due to distance. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 8 during operations.

**Site 9 Southern Pine Plantation**

Substation noise is the only SGP-related noise that would contribute to the noise environment at Site 9 during operations; however, average hourly noise from all SGP-related activities combined, including blasting, would have no effect on background ambient noise levels at Site 9 due to distance. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 9 during operations.

**Site 10 Yellow Pine**

Average hourly noise from all SGP-related activities combined, including blasting would have no effect on background ambient noise levels at Site 10. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 10 during operations.
Site 11 Ice Hole Campground in Boise National Forest

Substation noise is the only SGP-related noise that would contribute to the noise environment at Site 11 during operations; however, average hourly noise from all SGP-related activities combined, including blasting, would have no effect on background ambient noise levels. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 11 during operations.

Site 12 Mule Hill Trailhead

Noise from all SGP-related activities combined, including blasting, would attenuate to, below the 55-dBA threshold and background ambient sound levels at Site 12. The 2021 MMP would have a negligible, long-term, and localized impact on the noise environment at Site 12 during operations.

Frank Church-River of No Return Wilderness Areas

Noise levels at a range of distances from the Burntlog Route also were estimated to evaluate SGP-related noise from road maintenance activity in portions of the adjacent FCRNRW east of the Burntlog Route that closely borders the roadway (Table 4.6-8). The 5.3-mile Riordan Creek segment of Burntlog Route would be the closest portion to the FCRNRW, resulting in the potential for elevated noise levels to extend further into the FCNRNW area along this segment.

Direct effects on recreationists within approximately 4,000 feet from the roadway could include general annoyance. Indirect effects could include a reduction in the overall quality of the remote wilderness experience. Noise level impacts would be lower farther from the Burntlog Route and would attenuate to a less than perceptible difference at approximately 6,000 feet (1.15 miles). The predicted noise levels in Table 4.6-8 assume line-of-sight noise transmission and do not take into account obstructions of this path due to terrain which would reduce the noise levels from those predicted.

Table 4.6-8 Estimated Road Maintenance Noise Levels from the Burntlog Route during Operations

<table>
<thead>
<tr>
<th>Distance from Access Route (feet)</th>
<th>SGP-Related Road Maintenance Noise Level (dBA LEQ, summer-winter)</th>
<th>SGP plus Baseline Noise Level1 (dBA LEQ, summer-winter)</th>
<th>Increase above Baseline Noise Level2 (dBA LEQ, summer-winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>64-66</td>
<td>64-66</td>
<td>24-26</td>
</tr>
<tr>
<td>1,000</td>
<td>57-59</td>
<td>57-59</td>
<td>17-19</td>
</tr>
<tr>
<td>2,000</td>
<td>49-52</td>
<td>50-52</td>
<td>10-12</td>
</tr>
<tr>
<td>3,000</td>
<td>45-47</td>
<td>46-48</td>
<td>6-8</td>
</tr>
<tr>
<td>4,000</td>
<td>41-43</td>
<td>44-45</td>
<td>4-5</td>
</tr>
<tr>
<td>5,000</td>
<td>38-40</td>
<td>42-43</td>
<td>3-4</td>
</tr>
<tr>
<td>6,000</td>
<td>36-38</td>
<td>41-42</td>
<td>1-2</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

1Based on ambient sound levels measured at the Meadow Creek Lookout and along Burnt Log Road, average ambient daytime sound levels within the FCRNRW area are estimated at 40 dBA L_{EQ,1h}.

2Reported increase over baseline is increase in combined SGP + baseline over baseline.
Overall, the greatest potential noise impacts from road maintenance would occur where the Burntlog Route closely borders the FCRNRW. These potential noise impacts would be minor and long-term, but periodic or intermittent, and localized, only impacting a discrete area of the FCRNRW that is within approximately 4,000 feet of the Burntlog Route.

Noise levels at a range of distances from the Burntlog Route also were estimated to evaluate SGP-related traffic noise in portions of the adjacent FCRNRW that closely border the roadway, summarized here and further detailed in the Noise Specialist Report (Forest Service 2022d). SGP-related traffic noise from the Burntlog Route would attenuate to well below the average ambient daytime sound levels within the FCRNRW 500 feet from the roadway. Overall, aside from the noise impact predicted at Site 5, SGP-related traffic during the operations phase would have negligible to no effect on the ambient sound environment at the NSR locations.

If the borrow areas along the Burntlog Route adjacent to the FCRNRW are utilized during the operations phase, potential impacts to recreationists within approximately 1,000 to 2,000 feet of these borrow areas would be the same as during the construction phase.

**Closure and Reclamation**

**Operations Area Boundary**

Major noise-generating activities at the Operations Area Boundary during closure would include the operation of heavy industrial-type earth moving equipment for the placement of materials, grading, contouring, and similar activities associated with reclamation. In the absence of a detailed list of equipment to be used during the closure phase, a conservative assumption was made that equipment and numbers of each equipment type would be the same or similar to the construction phase. The estimated total average hourly noise levels and noise attenuation from the Operations Area Boundary during closure and reclamation would be the same as during construction, as described above and further detailed in the Noise Specialist Report (Forest Service 2022d).

**Access Roads**

During closure, the Burntlog Route would continue to be in use. Potential noise sources from the access road during closure would include road maintenance, SGP-related traffic, borrow areas, and road decommissioning of the Burnt Log Road-Thunder Mountain Road Connector.

**Road Maintenance**

Road maintenance activities and equipment are assumed to be the same as during the operation phase described above. Noise impacts from road maintenance during closure and reclamation would be minor, short-term, and localized.

**SGP-Related Traffic During the Access Road Closure Phase**

During closure, SGP-related traffic would continue to utilize the Burntlog Route. Traffic volumes would be lower than during the operation phase. Total average annual daily traffic is estimated at 27 AADT (versus 50 ADDT during the operation phase), Heavy vehicle volumes are estimated to be 15 AADT
(versus 33 ADDT during the operation phase) and light vehicle volumes are estimated to be 12 AADT (versus 17 AADT during the operation phase) (Perpetua 2021a). Assuming 10 percent of AADT at peak hour and vehicle speeds of 25 mph, traffic noise levels 50 feet from the mine access road would be 43 dBA LEQ, 5 dBA lower than during the operations phase, primarily due to the substantially lower volume of heavy vehicles on the roadway. Noise impacts from SGP-related traffic during access road closure would be minor, short term, and localized from SH 55 to the SGLF and from the SGLF to the SGP on the Burntlog Route.

**Borrow Areas**

Activity, equipment, and noise levels at borrow areas are expected to be similar to the construction and operations phases. It is unknown which borrow areas would be active within each SGP phase. Noise impacts from borrow areas would be negligible to minor, short-term but intermittent, and localized.

**Road Decommissioning**

Decommissioning the Burnt Log Road-Thunder Mountain Road Connector section of the Burntlog Route would likely involve the same or similar set of equipment as construction and would generate similar noise levels as described in for road construction under that phase; however, road decommissioning activity would be limited to just this section of the Operations Area Boundary access road. Noise impacts from road decommissioning would be negligible to minor, short term, and localized.

**Utilities**

Under the 2021 MMP, the new transmission line into the SGP would be decommissioned and reclaimed. In the absence of a detailed schedule of equipment being operated for decommissioning and reclamation at the transmission line during closure, it was assumed that equipment used during this phase would be similar to equipment detailed in environmental documents for other transmission line projects. The estimate of total average hourly noise levels is considered conservative, assuming the simultaneous operation of all the equipment, summarized below and described in further detail in the Noise Specialist Report (Forest Service 2022d).

The estimated total average hourly noise levels generated from the transmission line decommissioning would be 81 dBA LEQ at the reference distance of 50 feet, slightly lower than noise levels generated during construction. Noise from transmission line decommissioning would attenuate to the threshold of 55 dBA approximately 0.19 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from transmission line decommissioning would attenuate to 55 dBA approximately 0.11 mile from the source of activity. Noise impacts from utilities during closure and reclamation would be negligible to minor, long term, and localized.

**Off-Site Facilities**

The sound sources associated with the closure and reclamation of the Burntlog Maintenance Facility was conservatively assumed to be similar to those associated with construction activities, as described above. There would be no reclamation-related noise associated with the SGLF. The facility has a post-mining land use designated as light industry, where it would remain un-reclaimed after mine operations and
transferred to a third-party for light industrial uses. Noise impacts from off-site facilities during closure and reclamation would be minor, short term, and localized.

**Avalanches**

During closure and reclamation under the 2021 MMP, impacts from avalanches and controls would be the same as described for construction.

**Noise Impacts**

Estimated noise levels at noise receiver locations during the closure and reclamation phase under the 2021 MMP are included in Table 4.6-9.

**Table 4.6-9 2021 MMP Noise Levels at NSR Locations During Closure and Reclamation**

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA Leq)</th>
<th>Baseline Ambient Noise Level (dBA LDN)</th>
<th>SGP-Attributed Daytime Noise Level (dBA Leq)</th>
<th>SGP-Attributed Day-Night Noise Level (dBA LDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>47&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td>45</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/ Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>N/A</td>
<td>51</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>N/A</td>
<td>50</td>
<td>54&lt;sup&gt;2&lt;/sup&gt;</td>
<td>52&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/Boise National Forest</td>
<td>N/A</td>
<td>50</td>
<td>38</td>
<td>36</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40</td>
<td>N/A</td>
<td>40</td>
<td>38</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

<sup>1</sup>Temporary short-term exceedance of the recommended noise level.

<sup>2</sup>Value does not exceed the 55 dBA threshold but does exceed the ambient noise level.
Access road decommissioning work on the Burntlog Route would be the greatest contributor of SGP noise at Site 5 during the closure phase. Noise from all SGP-related activities combined would attenuate to approximately 47 dBA at Site 5, resulting in a temporary increase in noise levels above the 55-dBA threshold. The 2021 MMP would have a minor, temporary, and localized impact on the noise environment at Site 5 during closure while access road decommissioning and facilities decommissioning work is occurring in the immediate vicinity.

### 4.6.2.3 Johnson Creek Route Alternative

#### Construction

##### Avalanches

During construction under the Johnson Creek Route Alternative, there are 94 potential avalanche paths present. Additional details summarizing each avalanche hazard are provided in the Noise Specialist Report (Forest Service 2022d). The number and frequency of use of avalanche control measures are included in **Table 4.6-10**.

**Table 4.6-10 Expected Number and Frequency of Use of Avalanche Control for Each Access Route Option**

<table>
<thead>
<tr>
<th>Road Segment</th>
<th># Targets¹</th>
<th># Targets/ Mission¹,²</th>
<th># Missions/ Year²</th>
<th># Charges/ Year³</th>
<th>Road Total # Charges/Year³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Lake Summit (Warm Lake to Landmark)</td>
<td>23</td>
<td>15</td>
<td>4.0</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Johnson Creek Road (Landmark to Yellow Pine)</td>
<td>26</td>
<td>15</td>
<td>0.3</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>Stibnite Road South (Yellow Pine to Stibnite Mine)</td>
<td>97</td>
<td>71</td>
<td>1.0</td>
<td>81</td>
<td>85</td>
</tr>
</tbody>
</table>

Source: DAC 2021

¹Targets (control points) per path that may be used per mission.

²Missions are a function of the frequency estimate. Typically, control frequency was assumed to be three times more frequent than the natural return period of avalanches to the road. The relationship between return period and control frequency was adjusted for some paths. For example, even though Stibnite Road has many more control targets, many of these are on the south facing paths with lower frequency (10-30 years typically) and thus would require infrequent avalanche control during major winters (e.g., 10-year or greater).

³Charges are the targets per mission multiplied by missions per year, summed over all the paths on a road segment.

The amount of avalanche control needed each winter would vary depending on winter conditions of the year. There are approximately five missions per year, limiting the amount of avalanche abatement measures to a narrow timeframe of the year, with a minor, long-term, and localized impact.

#### Noise Impacts

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed or used to access the Operations Area Boundary and no road improvements or road construction would take place in that area. The Johnson Creek Route would be improved and used to access the SGP during construction,
Road widening and straightening, along with drainage and bridge improvements would be required for the Johnson Creek Road portion of the Johnson Creek Route. The Stibnite Road portion would be improved by straightening curves, constructing retaining walls, and installing culverts. During the construction phase, SGP-related traffic volumes on the Johnson Creek Route access road is estimated at 65 AADT. Heavy vehicles are estimated at 45 AADT and light vehicles at 20 AADT (Perpetua 2021a). Vehicles per peak hour were assumed to be 10 percent of AADT (Washington State Department of Transportation 2018). Based on the estimated traffic volumes and vehicle mix, and typical vehicle speeds of 25 mph, estimated average hourly noise levels from SGP-related traffic on the mine access route during the construction phase would be 48 dBA L_{EQ} at a distance of 50 feet from the roadway, which is well below the impact threshold level of 55 dBA.

EDFs as presented in Section 2.4.9 would be implemented and have been considered in the analysis of construction impacts of the Johnson Creek Route Alternative. Table 4.6-11 provides estimated noise levels at NSRs during the construction phase under the Johnson Creek Route Alternative. The Johnson Creek Route Alternative would have temporary impacts on the noise environment at Site 2, Site 9, Site 10, and Site 11 during transmission line work in the immediate vicinity.

Table 4.6-11 Johnson Creek Route Alternative Noise Levels at NSR Locations During Construction

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA L_{EQ})</th>
<th>Baseline Ambient Noise Level (dBA L_{DN})</th>
<th>SGP-Attributed Daytime Noise Level (dBA L_{EQ})</th>
<th>SGP-Attributed Day-Night Noise Level (dBA L_{DN})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>84\textsuperscript{1}</td>
<td>82\textsuperscript{1}</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>48\textsuperscript{2}</td>
<td>46\textsuperscript{2}</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/ Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/ Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>48</td>
<td>46</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>N/A</td>
<td>51</td>
<td>64\textsuperscript{1}</td>
<td>62\textsuperscript{1}</td>
</tr>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>N/A</td>
<td>50</td>
<td>64\textsuperscript{1}</td>
<td>62\textsuperscript{1}</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/ Boise National Forest</td>
<td>N/A</td>
<td>50</td>
<td>63\textsuperscript{1}</td>
<td>61\textsuperscript{1}</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40</td>
<td>N/A</td>
<td>20</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d

\textsuperscript{1}Temporary Short-term exceedance of the recommended noise level, shaded in gray. \textsuperscript{2}Value does not exceed the 55 dBA threshold but does exceed the ambient noise level.
Frank Church-River of No Return Wilderness Areas

The potential noise impacts at dispersed recreational resource areas within the FCRNRW would be the same as reported for the 2021 MMP during construction, provided in terms of predicted noise level and noise level increases over existing at distances between 500 and 8,000 feet; however, the primary access road would access the Operations Area Boundary from the north along the existing Stibnite Road and would approach close to the FCRNRW for a very limited distance about midway between the Operations Area Boundary and the village of Yellow Pine, which would represent a much more limited exposure than the Burntlog Route under the 2021 MMP (Figure 3.6-1).

Operations

Avalanches

During operations under the Johnson Creek Route Alternative, impacts would be the same as during construction.

Noise Impacts

Under the Johnson Creek Route Alternative, SGP-related traffic and road maintenance activities would occur along the Johnson Creek Route instead of the Burntlog Route. SGP-related traffic would contribute some noise levels during operations; however, road maintenance activities would temporarily increase daytime noise levels at Site 2, Site 5, Site 10, and Site 11 as high as 75 to 84 dBA.

EDFs as presented in Section 2.4.9 would be implemented and have been considered in the analysis of operations impacts of the Johnson Creek Route Alternative. Table 4.6-12 provides estimated noise levels at NSRs during construction under the Johnson Creek Route Alternative.

Table 4.6-12  Johnson Creek Route Alternative Noise Levels at NSR Locations During Operations

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA $L_{EO}$)</th>
<th>Baseline Ambient Noise Level (dBA $L_{DN}$)</th>
<th>SGP-Attributed Daytime Noise Level (dBA $L_{EO}$)</th>
<th>SGP-Attributed Day-Night Noise Level (dBA $L_{DN}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>78¹</td>
<td>76¹</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>75¹</td>
<td>73¹</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/ Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/ Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>25</td>
<td>23</td>
</tr>
</tbody>
</table>
The Johnson Creek Route Alternative would have localized, temporary and periodic, and minor impacts on the noise environment at Site 2, Site 5, Site 10 and Site 11 during road maintenance throughout operations. The estimated noise levels and noise impacts at all other noise receivers would be the same as the 2021 MMP during operations.

**Closure and Reclamation**

**Avalanches**

During closure and reclamation under the Johnson Creek Route Alternative, impacts would be the same as during construction.

**Noise Impacts**

Table 4.6-13 provides estimated noise levels at NSRs during closure and reclamation under the Johnson Creek Route Alternative. The Johnson Creek and Stibnite roads would not be decommissioned and would remain as built under the Johnson Creek Route Alternative. SGP-related closure and reclamation noise would be greater than ambient levels at Site 5 and Site 10; however, it would be intermittent or periodic as SGP-related traffic moves through those areas. The sound sources associated with the closure and reclamation of the Landmark Maintenance Facility was conservatively assumed to be similar to those associated with construction activities. Noise impacts under closure and reclamation would be short-term, localized, and negligible to minor.
Table 4.6-13  Johnson Creek Route Alternative Noise Levels at NSRs During Closure and Reclamation

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Baseline Ambient Noise Level (dBA Leq)</th>
<th>Baseline Ambient Noise Level (dBA LDN)</th>
<th>SGP-Attributed Daytime Noise Level (dBA Leq)</th>
<th>SGP-Attributed Day-Night Noise Level (dBA LDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 2</td>
<td>Miller Residence</td>
<td>N/A</td>
<td>50</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>Site 3</td>
<td>Meadow Creek Lookout</td>
<td>45</td>
<td>N/A</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Site 5</td>
<td>Forest Service Camp at Landmark</td>
<td>N/A</td>
<td>34</td>
<td>54(^1)</td>
<td>52(^1)</td>
</tr>
<tr>
<td>Site 6</td>
<td>Forest Service Summer Camp/ Warm Lake Recreation Areas</td>
<td>N/A</td>
<td>34</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Site 7</td>
<td>Warm Lake Road/ Warm Lake Camp</td>
<td>N/A</td>
<td>47</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Site 8</td>
<td>Granite Excavation Shop in Cascade</td>
<td>N/A</td>
<td>61</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 9</td>
<td>Southern Pines Plantation Property</td>
<td>N/A</td>
<td>51</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Site 10</td>
<td>Yellow Pine</td>
<td>N/A</td>
<td>50</td>
<td>54(^1)</td>
<td>52(^1)</td>
</tr>
<tr>
<td>Site 11</td>
<td>Ice Hole Campground/ Boise National Forest</td>
<td>N/A</td>
<td>50</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>Site 12</td>
<td>Mule Hill Trailhead</td>
<td>40</td>
<td>N/A</td>
<td>20</td>
<td>17</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d
\(^1\) Temporary short-term exceedance of the recommended noise level.

4.6.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Noise impacts.

4.6.4 Irreversible and Irretrievable Commitments of Public Resources

4.6.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. Consequently, there would be no irretrievable and irreversible commitment of public resources as it relates to the ambient noise environment.
4.6.4.2 Action Alternatives

The SGP would not contribute to irretrievable and irreversible commitment of public resources as it relates to the ambient noise environment. All noise sources and noise impacts associated with the SGP would cease upon final closure of the Operations Area Boundary and noise levels would return to ambient conditions without acoustical contribution of SGP-related activities. The future non-SGP ambient sound environment is likely to be similar to the reported baseline, adjusted only by changes in non-SGP acoustical contributors such as roadway traffic flows and the potential for new residential, commercial, and industrial development in the Operations Area Boundary vicinity.

4.6.5 Short-term Uses versus Long-term Productivity

4.6.5.1 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. Consequently, there would be no short-term use that would affect the ambient noise environment, and no effect on long-term productivity.

4.6.5.2 Action Alternatives

Modeled noise levels did not rise beyond threshold of concern under most conditions, and the noise related to mining and associated activities would represent a temporary use (during the estimated 20-year life of the mine between construction and reclamation) expected to end with SGP reclamation and would not affect long-term productivity.

4.7 Hazardous Materials

4.7.1 Impacts Definitions and Effects Analysis Indicators and Methodology

The analysis of potential effects from hazardous materials includes the following issue and indicators:

**Issue:** The SGP may cause accidental releases of hazardous materials or wastes, including diesel fuel, gasoline, lubricants, antifreeze, chemical reagents and reactants (including sodium cyanide and sulfuric acid), antimony concentrate, mercury containing residuals, lime, explosives, and other substances during their transport, use, storage, or disposal.

**Indicators:**

- Volumes and types of hazardous materials and hazardous wastes transported, used, and stored during site operation;
- Practices for storage and use on site including primary/secondary/tertiary containment types and volumes and material handling practices;
- Amount of vehicular transport of hazardous materials during construction, operations, closure, and reclamation; and
- Travel routes and road conditions (e.g., terrain, proximity to water bodies, geohazard risk, etc.).
The assessment considers the measures to avoid or reduce impacts such as:

- Methods for transporting and safely storing such materials;
- Methods and ability to respond to potential spill events; and
- Methods and plan for waste disposal.

Use and transport of hazardous materials is currently occurring at the site associated with exploration activities as described in Section 3.7. The existing conditions are compared to the increased use and transport of hazardous materials anticipated under the proposed mining activities (Perpetua 2021a). In addition, the analysis considers modifications to existing and new access routes and proposed support facilities.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.7.2 Direct and Indirect Effects

The following analysis of effects associated with hazardous materials is considered in the overall context of direct impacts caused by accidental releases or spills to localized areas, as well as potential impacts to outlying areas associated with releases to groundwater or nearby drainages/streams/surface waters. Elements of this context include:

- Amount, type, and location of storage, use, or disposal of hazardous materials and the potential for release to the environment;
- Transportation of hazardous materials to or from the mine site, and the potential for accidental release to the environment; and
- Fate and transport (i.e., where the hazardous material may go in the environment) of hazardous materials that have entered the environment.

Impacts associated with the storage, use, and disposal of hazardous materials are measured quantitatively by the amount, type, and location of use. Impacts to the environment in the event of an accidental release are assessed qualitatively, based on the type and amount of hazardous material, handling techniques, location of use and contingency plans, risk of accidental release, and exposure pathway to potential sensitive receptors.

The operation of the SGP would involve the use of various materials in order to mine, process, and extract the metals from the ore and conduct related activities. A release event could range from a minor spill of up to a few gallons (for which on-site cleanup would be readily available) to a large, reportable spill (e.g., over 25 gallons of fuel or any material that has or is likely to affect water). Some hazardous chemicals could have immediate adverse impact on soils and vegetation, and potentially degrade aquatic resources and water quality if they enter surface water. Releases of hazardous materials to the environment outside of secondary containments could potentially seep into the ground and contaminate the groundwater system over the long term. The risk and potential transport to the environment exists for all hazardous materials.
Releases of hazardous materials could adversely affect soils, vegetation, water quality, wildlife, and fish, including lower trophic level aquatic organisms (e.g., bacteria and algae). Impacts could include degraded soil and water quality, fish and wildlife habitat contamination, and toxicity, injury, or mortality to fish and other aquatic organisms, depending on the type and volume of material released, location, proximity to streams, timing, spill response, etc.

Impacts could occur at the Operations Area Boundary, off-site facilities, along access routes, or in downstream watersheds. The geographic extent of any impacts would depend on the location and size of the spill and the effectiveness of the response. For most releases, the extent would likely be limited to the immediate vicinity of the release due to the response and cleanup measures that would be in place, but if a release were to occur into a stream, impacts could extend downstream.

The potential for impacts would persist for the life of the SGP. More details regarding the effects of accidental release of hazardous materials to fish and aquatic resources are addressed in Section 4.12.

Local, state, and federal laws regulate the storage, use, recycling, disposal, and transportation of hazardous materials, wastes, and fuels. A SPCC Plan would be developed prior to SGP construction and operations, providing direction for preventing and controlling spills and describing BMPs to minimize the potential for releases of hazardous materials. In the event of a spill or release of hazardous materials or wastes, standard spill response and cleanup practices would be implemented to mitigate potential impacts, as described later in this section.

### 4.7.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua and use or transportation of certain hazardous materials at the SGP site would continue to be impacted by past mining activities and by currently permitted Perpetua exploration activities.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015b). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the Operations Area Boundary.

The continuation of approved exploration activities by Perpetua would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip. Consequently, there would be little change in the current use of hazardous materials at the site including fuel, oils, antifreeze, propane, and equipment maintenance products (Table 3.7-1). Small amounts of used oil and waste maintenance materials would continue to be produced and shipped from the site for offsite disposal.

Past mining activities have resulted in long-term impacts to the SGP site. Legacy impacts from these activities include the existing mining disturbances such as surface disposal of development rock, spent heap leach materials, and open pits. On-site processing of these ores has resulted in legacy tailings.
deposits. These mining wastes have resulted in documented environmental impacts to topography, soils, vegetation, groundwater, surface water, and biota.

In January 2021, Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of contaminated sediment, mine wastes, and tailings from within and along the banks of Lower Meadow Creek and the East Fork SFSR. It also includes construction of three stream diversions to prevent clean water from infiltrating source areas, and a study of selected adit discharges. The primary objective of these removal actions is to eliminate or reduce potential ecological and human exposure to metals by mitigating sources of contamination from contact with sediment and surface water. Removal actions would include excavating, localized transportation, and disposal of legacy mine wastes. Following these construction activities, the disturbed areas would be reclaimed with growth medium and revegetated to stabilize the sites. This work is planned to occur in 2022 and 2024.

The planned ASAOC activities would temporarily increase the use of fuels and lubricating oils at the SGP site for the duration of the Phase 1 activities. A total of 48 deliveries of fuel to the site has been estimated to be required over the 3 years required to complete the construction. These activities are being completed under CERCLA authority and are not subject to the NEPA analysis for the SGP.

### 4.7.2.2 2021 MMP

Under the 2021 MMP, the volume and types of hazardous materials transported, stored, and used at the mine site and off-site facilities would increase from the current conditions of the permitted exploration operations. Substantial quantities of fuels, lubricants, and chemicals would be transported annually via large trucks, and would be stored in aboveground storage tanks, bins, totes, and drums, within the required secondary containment designed to prevent spill releases to the environment.

Table 4.7-1 provides a list of the hazardous materials to be used under the 2021 MMP including their annual transport, number of annual deliveries, and on-site storage. Estimates of the wastes likely to be generated can be made based on the volume of materials proposed to be used.

<table>
<thead>
<tr>
<th>Name</th>
<th>Units</th>
<th>Annual Usage/Transport</th>
<th>Annual Deliveries</th>
<th>On-site storage capacity</th>
<th>Amount of Waste Likely to be Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel fuel</td>
<td>Gallons</td>
<td>5,800,000</td>
<td>580</td>
<td>200,000</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Lubricants</td>
<td>Gallons</td>
<td>296,000</td>
<td>99</td>
<td>30,000</td>
<td>148,000 (50% consumed)³ Off-site disposal.</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Gallons</td>
<td>500,000</td>
<td>100</td>
<td>10,000</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Antifreeze</td>
<td>Gallons</td>
<td>40,000</td>
<td>13</td>
<td>4,000</td>
<td>40,000 (assumed fully drained and recycled off site)</td>
</tr>
<tr>
<td>Propane-Buildings</td>
<td>Gallons</td>
<td>560,000</td>
<td>93</td>
<td>30,000</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Propane-Lime Plant</td>
<td>Gallons</td>
<td>1,463,000</td>
<td>133</td>
<td>30,000</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Name</td>
<td>Units</td>
<td>Annual Usage/Transport</td>
<td>Annual Deliveries</td>
<td>On-site storage capacity</td>
<td>Amount of Waste Likely to be Generated</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Antimony Concentrate</td>
<td>Tons</td>
<td>Variable 0 to 17,500</td>
<td>Variable 0 to 730</td>
<td>Variable</td>
<td>All concentrate transported off-site with temporary daily staging at SGP</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
<td>Tons</td>
<td>7,300</td>
<td>304</td>
<td>200</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Explosives</td>
<td>Tons</td>
<td>100</td>
<td>20</td>
<td>20</td>
<td>0 (fully consumed)</td>
</tr>
<tr>
<td>Grinding media (balls for mill)</td>
<td>Tons</td>
<td>8,100</td>
<td>337</td>
<td>600</td>
<td>0 (typically consumed, any residuals recycled offsite)</td>
</tr>
<tr>
<td>Mill liners</td>
<td>Tons</td>
<td>650</td>
<td>94</td>
<td>650</td>
<td>200 (70% consumed, residual recycled offsite)</td>
</tr>
<tr>
<td>Crusher liners</td>
<td>Tons</td>
<td>160</td>
<td>1</td>
<td>160</td>
<td>80 (50% consumed, residual recycled offsite)</td>
</tr>
<tr>
<td>Sodium cyanide</td>
<td>Tons</td>
<td>4,000</td>
<td>167</td>
<td>300</td>
<td>Mostly consumed, residual quantity mixed with tailings, neutralized and discharged to the TSF³</td>
</tr>
<tr>
<td>Lime (process)</td>
<td>Tons</td>
<td>70,000</td>
<td>(produced on site)</td>
<td>4,000</td>
<td>0 (fully consumed in process, mixed with tailings as calcium carbonate)</td>
</tr>
<tr>
<td>Activated carbon</td>
<td>Tons</td>
<td>500</td>
<td>23</td>
<td>50</td>
<td>0 (recycled and re-activated)²</td>
</tr>
<tr>
<td>Copper sulfate</td>
<td>Tons</td>
<td>1,250</td>
<td>57</td>
<td>100</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Lead nitrate</td>
<td>Tons</td>
<td>800</td>
<td>37</td>
<td>25</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Aerophine 3418A</td>
<td>Gallons</td>
<td>10,500</td>
<td>53</td>
<td>400</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Methyl isobutyl carbonyl</td>
<td>Gallons</td>
<td>120,000</td>
<td>40</td>
<td>6,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Flocculant</td>
<td>Tons</td>
<td>300</td>
<td>15</td>
<td>50</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Sodium metabisulfite</td>
<td>Tons</td>
<td>2,000</td>
<td>91</td>
<td>200</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Potassium amyl xanthate</td>
<td>Tons</td>
<td>1,350</td>
<td>68</td>
<td>40</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>Tons</td>
<td>330</td>
<td>15</td>
<td>40</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>Gallons</td>
<td>65,000</td>
<td>22</td>
<td>6,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Scale control reagents</td>
<td>Gallons</td>
<td>5,000</td>
<td>5</td>
<td>1,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Gallons</td>
<td>7,100</td>
<td>2</td>
<td>10,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>Gallons</td>
<td>2,000</td>
<td>2</td>
<td>1,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>Gallons</td>
<td>12,000</td>
<td>5</td>
<td>8,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Ferric Sulfate</td>
<td>Gallons</td>
<td>23,000</td>
<td>17</td>
<td>6,000</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Sodium Bisulfite</td>
<td>Drums</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Lime (water treatment)</td>
<td>Tons</td>
<td>150</td>
<td>7</td>
<td>30</td>
<td>0 (consumed as a reagent)</td>
</tr>
<tr>
<td>Solvents</td>
<td>Gallon</td>
<td>1,000</td>
<td>5</td>
<td>1,000</td>
<td>1,000 (Spent solvent recycled off site)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Name</th>
<th>Units</th>
<th>Annual Usage/ Transport</th>
<th>Annual Deliveries</th>
<th>On-site storage capacity</th>
<th>Amount of Waste Likely to be Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries</td>
<td>Variable</td>
<td>Variable</td>
<td>25</td>
<td>500 units</td>
<td>Recycled offsite or disposed offsite as solid waste or special waste depending on characteristics.</td>
</tr>
<tr>
<td>Herbicides/Pesticides</td>
<td>Pounds</td>
<td>1,250</td>
<td>1</td>
<td>1,000</td>
<td>0 (fully consumed in use)</td>
</tr>
<tr>
<td>Wastes containing mercury from ore processing (carbon canisters, filter packs, gas condensers)</td>
<td>Pounds</td>
<td>Not quantified</td>
<td>Variable</td>
<td>Variable</td>
<td>Not quantified. Waste would be disposed off-site in permitted facilities.</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a

2 Some amount of carbon per ton of ore leached is likely lost to attrition. This lost material would end up in the tailings.
3 Waste would be in the form of cyanide mixed with tailings and would be sent to fully contained TSF for disposal. Cyanide levels would be reduced to less than 10 parts per million weak acid dissociable cyanide.

Specific components proposed under the 2021 MMP that would have hazardous materials include the Operations Area Boundary and off-site facilities. Within the Operations Area Boundary, areas with hazardous materials would include the maintenance workshop with truck wash (petroleum products and chemical storage, oil water separator), worker housing facility (with sanitary and solid waste), and the fuel and explosives storage at the mine site.

During the construction phase (approximately 2 to 3 years), the Operations Area Boundary would be accessed via the Johnson Creek Route until the Burntlog Route is completed. The Johnson Creek Route originates at Landmark at the intersection of Warm Lake Road and Johnson Creek Road and extends north on Johnson Creek Road (CR 10-413) for approximately 25 miles along Johnson Creek to the village of Yellow Pine. From there, the Stibnite Road (CR 50-412) continues eastward and southward along the East Fork SFSR entering the Operations Area Boundary from the north. The main watersheds that could be potentially impacted by releases of fuels or hazardous materials to the environment along this route include Johnson Creek and East Fork SFSR.

The largest volume of hazardous material or petroleum transferred to the mine site during construction would be diesel fuel. It is estimated that on average, two daily round trips to deliver fuel and miscellaneous supplies would occur (Table 2.4-2 provides the projections for all construction traffic to the mine site).

Although transportation of hazardous materials presents the greatest risk of impacts from spills and releases to the environment, all deliveries of fuel and hazardous loads would be escorted by pilot vehicles. The pilot vehicles would regulate the speed of transports for the current road conditions and would advise oncoming traffic to park until the convoy passes. These actions would reduce the potential for vehicle collisions and thus spills resulting from collisions. Hazardous materials would be transported to the mine site in USDOT certified containers and by USDOT registered transporters (Midas Gold 2016a).
During the mining and ore processing operations phase (approximately 15 years), the Operations Area Boundary would be accessed via the Burntlog Route. The Burntlog Route would connect the eastern end of Warm Lake Road at Landmark to the Operations Area Boundary via the existing Burntlog Road (FR 447), Meadow Creek Lookout Road (FR 51290), Thunder Mountain Road (FR 50375), and approximately 15 miles of new road constructed to connect the three. The road would cross through the drainage areas of Burntlog Creek, Trapper Creek, and upper Riordan Creek, all tributaries to Johnson Creek. It would then descend across the upper Meadow Creek and East Fork SFSR drainages entering the Operations Area Boundary from the southeast. The main watersheds that could be affected by releases of fuels or hazardous materials along this route are Burntlog Creek, Trapper Creek, and the upper portions of Riordan Creek, Meadow Creek, and East Fork SFSR.

Hazardous materials such as diesel, gasoline, propane, lubricants, hydraulic oil, antifreeze, explosives, antimony concentrate, and ore processing reagents would be transported, stored, and used at the mine site, and potentially at off-site facilities (Table 4.7-1). Shipments would be transported by truck along the Burntlog Route in USDOT approved containers or bulk tanker trucks, depending on the material and vendor. During construction, it is estimated that the truck AADT between SGLF and Operations Area Boundary would be 45 trips per day. It is estimated that on average, 33 daily round trips of trucks to transport ore processing supplies, fuel, concentrate, and other materials would occur between SGLF and Operations Area Boundary during operations, and 15 trips per day during closure and reclamation. Table 2.4-2 provides the projections for all traffic during mining and ore processing operations to the mine site.

The majority of hazardous materials used on site would be spent or consumed during operations (Table 4.7-1). Materials that are not spent or consumed (e.g., lubricants, antifreeze, solvents) would be recycled, to the extent practical, or disposed off-site in an approved depository in accordance with applicable federal and state laws (Perpetua 2021a). Antimony concentrate produced at the mine site would be transported off-site for processing. Descriptions of the handling practices for various materials at the site follow.

**Liquid Petroleum Products and Wastes**

Aboveground storage tanks would be used for fuels and other petroleum fluids, including gasoline, diesel fuel, lubricants, coolants, hydraulic fluids, and propane at the mine site, as outlined in a SPCC Plan required for the mine site under Section 311(j)(1)(C) of the CWA. The storage tank facility for gasoline, diesel fuel, and propane would be located near the maintenance workshop with additional propane storage at the ore processing facility area, the underground portal area, and the worker housing facility. Approximate fuel and petroleum volumes for diesel, gasoline, and propane that would be stored at the mine site are included in Table 4.7-1.

Motor oils, lubricants, antifreeze, and solvents would be shipped to the mine site on trucks. These would be stored in approved containers located within, or directly adjacent to, the maintenance shop and contained within secondary containments to prevent spills into the environment. All used petroleum products, waste antifreeze, and used solvents would be collected in approved containers, transported off site, and disposed or recycled.

All liquid petroleum products would be managed in closed tanks or containers that are located within secondary containment areas such that a complete release of petroleum from the largest tank or container...
with the secondary containment area would be retained in the area without release to the environment. The procedures in the SPCC Plan would cover all activities related to receipt, storage, and dispensing petroleum products in a manner that would minimize spills and prevent releases outside of the secondary containment areas. Inspections, security, and maintenance activities of all petroleum storage facilities would minimize the potential for spills from tanks and containers, and prompt cleanup of any such spills.

The 2021 MMP includes the operation of four new substations and upgrades to five existing substations, which would require quantities of dielectric oils (i.e., mineral oils). These oils would be contained within the substation equipment and as per the site-specific SPCC plans, design of the substation yards would prevent discharges out of the yards in the event of a leak from the electrical equipment.

Written spill response procedures and pre-positioned spill response supplies and tools would assist in containing and cleanup of any spills within and outside of secondary containments. SGP personnel would be trained in the execution of the SPCC Plan which would be reviewed and updated as needed through all phases of the SGP from construction through closure. Spills of fuel or oils outside of secondary containments would be responded to in a manner to control the size of the spill. The spilled petroleum and contaminated soil would be cleaned up and placed in steel bins or drums to be shipped off site for treatment or disposal.

**Cyanide Handling**

The International Cyanide Management Code (ICMC) is a voluntary initiative for the gold and silver mining industries and the producers and transporters of cyanide used in gold and silver mining. It is intended to complement a mine operation’s existing regulatory requirements. The ICMC focuses exclusively on the safe management of cyanide that is produced, transported, and used for the recovery of gold and silver, and on mill tailings and leach solutions. Standards of practice specific to cyanide transport, handling, storage, and emergency response under the ICMC include:

- Establish clear lines of responsibility for safety, security, release prevention, training, and emergency response in written agreements with producers, distributors, and transporters.
- Require that cyanide transporters implement appropriate emergency response plans and capabilities and employ adequate measures for cyanide management.
- Design and construct unloading, storage, and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, as well as spill prevention and spill containment measures.
- Operate unloading, storage, and mixing facilities to incorporate inspections, preventive maintenance, and contingency plans to prevent or contain releases and control and respond to worker exposures.
- Prepare detailed emergency response plans for potential cyanide releases.
- Involve site personnel and stakeholders in the planning process.
- Designate appropriate personnel and commit necessary equipment and resources for emergency response.
- Develop procedures for internal and external emergency notification and reporting.
• Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.
• Periodically evaluate response procedures and capabilities and revise them as needed.

Perpetua would purchase sodium cyanide from producers that are compliant with the ICMC and utilize ICMC certified and compliant transporters to transport the dry cyanide product from the manufacturer to the mine site. A common method of sodium cyanide transport is via ISO container, which holds dry sodium cyanide in the form of briquettes. ISO containers are heavy-duty steel containers that are air and watertight and are ruggedly designed within a steel framework to withstand rollovers and other accidents. The dry solid sodium cyanide is extracted by connecting the ISO container to the reagent circuit in the mill and circulating process water through the container, dissolving the briquettes and producing a sodium cyanide solution for use in the leach circuit. The ISO containers remain sealed at all times, during transportation and use at the site. The empty ISO containers are rinsed at the processing site and then returned to the supplier for reuse, removing the necessity for container disposal.

Additionally, the cyanide reagent and leach facilities at the processing site would be constructed and operated consistent with the ICMC standards. All pipes and tanks containing cyanide in solution would be located within secondary spill containment such that any spills of water containing cyanide in solution would be retained and recycled back to the process.

Any spill of water with cyanide in solution would be immediately responded to by containing and stopping the spill as soon as possible. The spilled water and any contaminated soil would be recovered and recycled back to the leach process or tailings circuit. Sampling of the remediated spill site would be done to confirm that the cleanup was completed.

Using sodium cyanide in the solid form eliminates the risk of fluid leaks or spills during transportation. Any released cyanide briquettes stay in place at the spill site. The spilled briquettes can be readily recovered with mechanical means placing the briquettes and any contaminated soil in a suitable container by a person equipped with appropriate personal protection equipment. The recovered material can be recycled into the leach process at the mill. Sampling of the remediated spill site would be done to confirm that the cleanup was completed.

During transportation, it is unlikely that any cyanide briquettes spilled on an access road would directly enter a live stream because of the separation of the road travel way from running streams. A more probable contact of the reagent with water could occur if the spill site on the road was wet with snow or rain and there was a concern over dissolved cyanide leaving the spill site. In this case the spilled material and any contaminated water would be contained at or near the spill site with earth berms and spill control materials. The spilled briquettes would be picked up and packaged and the contaminated soil and water treated on site or removed and either recycled at the SGP mill or packaged for offsite disposal as a waste.

**Process Reagents**

The mill process would require the use of multiple other reagents in different steps of the process (Table 4.7-1). Some of these reagents would be dry materials shipped in bags or supersacks. Other reagents would be liquids shipped in drums or totes and a few would be shipped in bulk tanker trucks. All reagents would be stored on site within secondary containment areas such that a leak of the shipping or storage...
containers or tanks would be retained in the secondary containments for cleanup without release to the environment. Process reagents would be used up in the process and become combined with the mill tailings and concentrate. Any spills of reagents would be contained and cleaned up by SGP personnel in appropriate personal protective equipment according to their safety data sheets.

**Explosives**

The main blasting agent to be used in the open pit mining would be ANFO consisting of ammonium nitrate and fuel oil. The dry ammonium nitrate prill would be shipped in bulk trucks and loaded into large bins at the SGP. It would be transported within the Operations Area Boundary in special trucks to the blast holes where it would be mixed with about 6 percent fuel oil and placed in the blast holes. The ANFO in the blast holes would be detonated with high explosive primers, detonating cord, and blasting caps. These other explosives would be delivered in boxes and stored in specially constructed and secured storage buildings (magazines) away from other SGP facilities. All explosives would be carefully managed by specially trained SGP personnel. High explosives are pre-packaged units that are not subject to any spillage. Spilled ammonium nitrate would be contained and cleaned up by mechanical means to be used on site. Any spilled fuel oil would be responded to as described above.

**Tailings Neutralization**

Sodium cyanide reagent would be dissolved in process water that was treated with lime to elevate the pH to at least 10. This would produce a solution of free cyanide ion in water. The free cyanide ion can dissolve precious metals in the leach circuit to remove the target metals from the solid ore or concentrate particles. The cyanide-metal complexes are then adsorbed from the leach solution by activated carbon removing much of the cyanide but some residual cyanide remains in the tailings slurry leaving the leach circuit. Tailings with high residual cyanide concentrations can be harmful to wildlife exposed to the tailings water. According to the International Cyanide Management Institute and its International Cyanide Management Code, reducing the weak-acid dissociable cyanide concentration in tailings to less than 50 mg/l should not harm terrestrial and avian wildlife. The EPA and IDEQ require a limit of three orders of magnitude lower than this for a discharge to the aquatic environment.

Cyanide leach tailings from the SGP would be neutralized within the ore processing facility before being pumped to the TSF. Tailings from the leaching circuit would first be routed to one or more tailings thickeners where much of the water would be recycled within the ore processing facility. Thickened tailings would then be pumped to the cyanide neutralization facility where the residual cyanide would be treated using sodium metabisulfate and air system (or equivalent) to oxidize cyanide to cyanate. Cyanate is a much less toxic compound and is further naturally degraded through hydrolysis chemical reactions in the tailings impoundment to form carbonate and ammonia. The tailings treatment would reduce the WAD cyanide concentrations to approximately 10 mg/L at the process facility before the tailings are pumped to the TSF.

In addition to the oxidation of cyanide, metals are also removed from solution by precipitation as metal hydroxides. The proposed cyanide neutralization process is capable of removing stable iron-cyanide complexes from solution. Ferricyanides are reduced to insoluble ferricyanide salts and precipitated from solution.
Throughout operations, remnant cyanide levels would be monitored in the treated leach tailings and the TSF supernatant pond to ensure they remain in compliance with issued approvals and permits and remain below concentrations harmful to wildlife.

**Tailings Water Management**

Tailings would be thickened at the process facility to directly recycle much of the process water back to the process. The thickened tailings slurry would be pumped from the mill process facility to the TSF. Cyanide concentrations in the tailings water would be reduced by treatment at the mill process to approximately 10 mg/L before being transported to the TSF. The tailings pipeline would be laid in a geosynthetic lined trench to contain any potential leaks from the pipeline and convey the leaks to lined containment ponds along the pipeline corridor. The reclaim water pipeline from the TSF back to the mill process would also be laid in the lined trench. Where the pipeline corridor passes under roads, the slurry and reclaim water pipelines would be contained in large pipes connected to the trench liner on either end. The same would be the case where the corridor passes over the East Fork SFES. The pipeline corridor would be designed and built to prevent release to the environment of any potential spills within the corridor.

In the TSF, the solid fraction of the tailings slurry would settle out and the tailings water would accumulate in the supernatant pool where reclaim pumps would remove the water and pump it back to the mill process for reuse. The TSF is designed to contain the tailings water and prevent leakage to the environment. The entire TSF impoundment would be lined with 60-mil linear low-density polyethylene membrane which would be underlain by secondary liner of GCL. To limit head on the liner system, portions of the liner system would be overlain by either a gravel or geocomposite overliner drain network to allow consolidation-related drainage to be collected and conveyed to a collection sump near the upstream toe of the embankment. The presence of the overliner drains would minimize hydraulic head on the liner system and allow tailings pore pressures to dissipate, facilitating consolidation during operations. Monitoring of the TSF liner would be accomplished with an underdrain system installed below the liner and reporting to a sump where the water flow and quality would be monitored. Downgradient groundwater monitoring wells would also be installed.

The TSF facility design and operation would comply with the Idaho Rules for Ore Processing by Cyanidation (IDAPA 58.01.13).

Following mill operations closure activities would include reducing the tailings water pool within the TSF by forced evaporation and pumping to an onsite wastewater treatment plant. The treatment plant would treat the water to receiving stream standards before discharge to Meadow Creek. After the tailings water was removed and the TSF cover was installed the surface runoff from the TSF would not require treatment.

**Contingency Plans**

Perpetua would maintain and exercise contingency plans for all possible emergency situations at the SGP including accidents, medical emergencies, fire/explosions, chemical spills, wildfire, extreme weather, geologic hazards, and avalanches. These plans would include responses to spills and releases of any of the hazardous materials used at the site. Response actions would include alarms, calling out trained SGP spill
response personnel, appropriate personal protective equipment, spill containment, cleanup, handling spill response wastes, and proper notifications to government agencies. Adequate spill response personnel and required spill response equipment and materials would be available at all times during construction through reclamation.

Since 2019 and according to a Community Partnership Agreement, Perpetua has discussed its development plans with the Stibnite Advisory Council, representing eight local communities. The Council has met regularly to inform the communities, identify potential impacts from the SGP development, and discuss opportunities to mitigate these impacts. Some of these discussions have included how Perpetua can provide resources to the local first responder agencies to support their training and preparedness for responding to potential spills or accidents involving SGP-related traffic. So far, Perpetua has reached out to all Valley County fire department to provide HAZWOPER training specific to the hazardous materials currently used on site. Perpetua has committed to continue to work closely with local fire, EMS, and law enforcement departments to offer joint safety/emergency training and share information on Perpetua's safety protocols and emergency preparedness plans. Perpetua would also enter into an agreement with Valley County to lessen impacts to county service providers and infrastructure, such as EMS, Sheriff, solid waste, etc.

The water balance between the different circuits in the processing mill and between the mill and the TSF would be maintained by constant pumping of water or slurry through the various parts of the water balance. Electric power for the SGP, including these pumps, would be supplied by the IPCo transmission line and on-site solar power generation. It is desirable to maintain these pumping rates and in the event of a power outage on the transmission line to the SGP, diesel and propane powered generators would automatically start to supplant the solar power generation and maintain electric power for priority uses at the SGP.

**Solid Waste Management**

All municipal waste and construction and demolition waste generated by the SGP would be collected in wildlife-resistant containers and hauled offsite for disposal in a municipal waste landfill. Concrete foundations and floors would be broken during demolition and covered in place with at least two feet of earth. Small scale composting associated with organic materials generated at the worker housing facility may be conducted at the Fiddle GMS.

**Hazardous Waste Management**

Material that meets the classification of hazardous waste would be collected and stored according to Idaho regulations implementing federal RCRA regulations on hazardous waste management. Such wastes would be accumulated in approved containers at designated collection locations in the facilities. These containers would be transferred to a 90-day storage site at the facilities prior to shipping to an offsite, permitted hazardous waste disposal facility.

The handling of hazardous waste, from generation through off-site disposal, would be done in concert with written procedures to comply with all applicable parts of the Idaho hazardous waste regulations. This would include written contingency plans identifying response and notifications actions in the event of a spill of hazardous waste at the SGP. The largest quantity of hazardous waste routinely produced by gold
mines is laboratory assay wastes containing lead. These materials are solids like slag, cupels, crucibles, and the like. These wastes are contained in steel bins that are sealed at the mine site before being shipped off site to permitted hazardous waste disposal facilities. In the unlikely event of a spill of these materials the spilled material could be readily recovered with mechanical means appropriate to the spill event placing the material and any contaminated soil in a suitable container by a person equipped with appropriate personal protection equipment. The recovered material would be replaced into the accumulation bins.

Autoclave refractory liner bricks are typically non-hazardous when new. They can become contaminated with metals during use at mine sites such that they must be handled as hazardous wastes when removed during maintenance relining of an autoclave. This would be determined at the SGP through operational experience during maintenance activities when the autoclave liner was rebuilt. Spent refractory material would be properly managed and disposed based on its characteristics when the waste was generated.

Smaller quantities of hazardous waste typically consist of waste maintenance materials such as solvents, paints, batteries, lamps, and electrical equipment. These materials would be accumulated in steel drums positioned near the points of generation of these materials. Any drums of liquid hazardous waste would be placed in secondary containment. Any spills would immediately be contained and remediated according to the site contingency plans.

**Antimony Concentrate Handling**

An estimated 15 to 20 percent of the total mill feed would contain sufficient antimony mineral grades (> 0.1 percent weight antimony) to warrant production of an antimony concentrate product. Annual production of antimony would be variable with almost all of the antimony being recovered from ore mined in the first 6 years of operations (M3 2021). After then, the antimony recovery circuit in the mill process would be operated infrequently and the gold/silver circuit would be operated alone when the antimony recovery circuit is bypassed. The SGP ore processing circuit would produce an antimony concentrate that would contain approximately 55 to 60 percent antimony by weight. The remaining 40 to 45 percent of the concentrate is predominantly sulfur (as sulfide in the stibnite) and common rock, with trace amounts of gold, silver, and mercury. Antimony concentrate would be produced at a rate of approximately 20 to 50 tons per day.

The antimony concentrate filtration and loading area would be within the flotation building. The concentrate would be a dry, granular material that would be placed in 2-ton supersack containers secured to a bagging machine. The filled supersacks would then be sealed in the building and loaded into 20-foot shipping containers at the process site. The loaded shipping containers would then be closed and affixed with shipping seals before being loaded onto trucks for transportation to the SGLF and then transported to market via highway legal trucks. The dual containment of supersacks within sealed shipping containers makes it unlikely that there would be spills of concentrate during transportation from the SGP. In the unlikely event that a concentrate spill occurred, the spilled concentrate could be recovered with mechanical means appropriate to the spill event, placing the recovered concentrate and any contaminated native material in a suitable container by a person equipped with appropriate personal protection equipment. The recovered material can be recycled into the process at the mill. Sampling of the remediated spill site would be done to confirm that the cleanup was completed.
**Mercury and Mercury Containing Materials**

In the gold and silver leaching process, small amounts of mercury would also be dissolved from the ore and follow the gold and silver through the rest of the process. During the carbon stripping process, a small amount of mercury may not desorb from the activated carbon. This residual mercury would volatilize in the carbon reactivation kiln and be controlled with a venturi scrubber and sulfur-impregnated carbon columns in the kiln off-gas stream. Solid waste from this process (i.e., the carbon canisters and filter packs) would be disposed offsite in a permitted solid waste or hazardous waste disposal facility depending on the mercury characteristics of the wastes.

Gold and silver would be precipitated from the carbon strip solution onto stainless steel mesh in the electrowinning circuit. The mesh would be removed from the electrowinning cells and washed to produce a metal-bearing sludge that would be filtered and placed into a retort to dry the material and volatilize any remaining impurities, such as mercury. The off gas from the retort would be passed through a chilled condenser, where any mercury would be converted to its liquid metallic state, collected in steel containers called "pigs" and then securely stored prior to shipment to a certified hazardous waste disposal facility. The off gas from the condenser would be passed through a bed of sulfur-impregnated carbon to collect any residual mercury vapor before the cleaned off gas would be released into the atmosphere.

The generation rates for these waste streams would be variable depending on the particular ore streams being processed in any one year but an estimate of average annual, total mercury content in flasks and other waste streams to be disposed offsite is 10.9 tons per year with 10.7 tons consisting of metallic mercury in flasks.

**Water Treatment Plant (WTP) Residuals**

Groundwater and surface water that has contacted rock involved in the mine operations is called "contact water". The chemistry of this water can be affected by its contact with the ore and development rock. This water would be collected and typically used as makeup water in the mill process. During wet seasons or other times when there may be more contact water than can be used in the mill, the excess contact water would be treated to a quality where it could be discharged to Meadow Creek or East Fork SFSR in compliance with the discharge limitations of an IPDES discharge permit issued by the IDEQ. The WTP would be located at the mill site during operations and near the base of the TSF embankment during closure.

The objective of the water treatment would be to remove dissolved metals by chemical precipitation, flocculation, filtration, and final chemistry adjustment of the treated water prior to discharge. If needed, organic sulfide, reverse osmosis, nanofiltration, or ion exchange steps may be added to the treatment process. During closure activities of the TSF, in addition to metals removal, the WTP would incorporate additional steps to treat TDS and any residual cyanide in the influent water.

The WTP would produce a residuals slurry that would be disposed in the TSF. During operations, this slurry would be mixed with the rest of the mill tailings slurry to be pumped to the TSF for disposal. During closure, the residuals slurry would be filtered at the WTP and hauled to a designated disposal location in the TSF. Current evaluation of the potential chemistry of the WTP residuals indicate the
material would not exhibit hazardous waste characteristics. The design and operation of the WTP would purposely produce residuals that would not have hazardous waste characteristics.

Transportation of Hazardous Materials

All SGP access routes could present occasionally adverse road conditions that are common on remote mountain roads, especially due to ice and snow conditions during winter months. Road conditions on high mountain passes such as Landmark Big Creek Summit, and portions of the Burntlog Route may be particularly challenging in the winter. Both the Burntlog and Johnson Creek routes have segments with steep grades (above 6 percent), and no emergency truck ramps are present or planned on the routes. Switchbacks and reduced turning radius also may be a challenge for large trucks operating on these roads.

Perpetua has prepared a written Transportation Management Plan that describes standard operating procedures for transportation of fuels and hazardous materials (materials) that would require adherence to the following:

- All materials would be transported to the SGP in USDOT approved containers and by USDOT registered transporters who will comply with applicable USDOT, OSHA, and MSHA regulations. Transportation of materials would comply with USDOT requirements for markings, labels, and placards.

- Transporter drivers would be experienced in their specific truck haulage practices on NFS roads including travel routes and safe speeds for all parts of the routes, especially steep slopes.

- Schedules for delivery of materials to the SGP would be planned in advance with established dates and times communicated to SGP personnel involved and all deliveries of materials would occur during daylight hours.

- All hazardous material shipments over the mine access roads would be done with single trailer trucks.

- Transporters of materials would be required to check in at the SGLF for: safety inspections of the vehicle; providing documentation of spill response, safety, and resource awareness training; demonstrating presence of spill cleanup kit on the vehicle, coordinating use of GPS vehicle tracking signal with SGP security, receive SGP site-specific safety and safe-driver training, and briefings on the Idaho State EMS, first responder actions, importance of anadromous fisheries, and current Burntlog Route conditions.

- Pilot vehicles would escort all materials shipments in and out of the SGP access roads and have radio contact with the site and transport vehicles.

- All pilot and SGP emergency response vehicles would carry spill containment and cleanup equipment and materials, as well as first aid kits.

- Pilot vehicles would advise oncoming traffic to park until the convoy passes and would regulate the speed of the convoy for the current conditions of the road.
• Road signs would be placed at both ends of the route while a convoy of materials is operating warning other traffic to use caution.

• Spill response equipment and supplies would be pre-positioned at SGP facilities and along the access routes. SGP personnel would be trained in the use of spill response supplies and equipment including knowledge of where and how to contain and cleanup spills.

Perpetua has prepared a Vehicle Incident Emergency Response Plan that includes best practices for responding to accidents occurring on the access routes. The Perpetua Emergency Response Staff would assume a lead role in these responses and local law enforcement would be contacted to address blockage of the access route. Adequate Perpetua support personnel would be scheduled to be present at all times, including site-specific training and 40-hour HAZWOPER training for spill response.

Perpetua has inventoried the potential locations of earth instability (landslides and rockfalls) and snow avalanches along the potential access routes to the SGP. These are discussed in Sections 3.2 and 4.2. Where these hazards might occur during operations, they could impact the ability of traffic using the access routes and in unlikely situations could impact passing vehicles. Table 3.2-1 compares identified geohazards of the two access routes to the SGP and shows the Johnson Creek Route, that would be used during initial 2021 MMP construction, has 45 locations of landslides and rockfalls and 94 avalanche paths. The Burntlog Route crosses 26 landslide/rockfall areas and 38 avalanche paths. These geohazards present along the road corridors could increase the potential for truck accidents resulting in spills of hazardous materials. The Johnson Creek Route has increased potential for trucking accidents and greater spill risk from these geohazards compared to the Burntlog Route.

Perpetua has committed to monitoring and control measures to reduce the potential impacts of these hazards. For avalanche hazards, Perpetua would post warning signs along the routes indicating avalanche prone areas and include the locations of these areas in safety information provided to transporters using the routes. This information would be updated annually as needed for changed conditions. During avalanche season Perpetua would:

• Conduct daily region-scale assessment of avalanche parameters using in-house avalanche forecasters.
• Conduct weather conditions assessment daily including snowpack, avalanches, and road conditions.
• Notify SGP staff when avalanche conditions are highly unstable.
• Close access routes during periods of elevated avalanche hazard or blocked roads.
• Control avalanche initiation with explosives or equivalent means.

Earth movements like landslides and rockfalls are exacerbated by periods of heavy precipitation and by diurnal freeze/thaw cycles typical of spring weather. They may also be seismically induced. Protection measures such as rock bolting, netting, and signage would be installed along road segments susceptible to rock falls. Other road design features would be incorporated such as cut slope laybacks, retaining walls, soil nails, and slope dewatering to reduce the potential for slope failures. Removal of earth debris along access routes would be covered in the maintenance agreement with Valley County.
Based on the proposed hazardous materials, supplies, reagents, and wastes being transported to and from the Operations Area Boundary, the greatest concern would be a significant release of a hazardous material from a transportation accident. Data accessed from the Federal Motor Carrier Safety Administration (Federal Motor Carrier Safety Administration [FCSA] 2018) website (www.fmcsa.dot.gov) show very low rates of large truck accidents resulting in spills of hazardous material. Strict regulatory controls and SGP emergency response procedures would be expected to limit the extent of any such incidents.

To evaluate the potential impact of the transport of hazardous materials to and from the mine site, the risk of a transportation accident resulting in the release of hazardous materials was estimated. Accident and incident rates were derived from national statistics for truck accidents that involve hazardous materials as published by the Federal Motor Carrier Safety Administration (2018). Records show that the number of large trucks (gross vehicle weight of more than 10,000 pounds) on national highways from 2013 to 2016 ranged from over 10.59 million to 11.49 million; with large trucks traveling between 275.01 billion miles to 287.89 billion miles annually. Over that same time frame, large truck crashes involving hazardous materials cargo (with no release) ranged from 2,420 to 2,475, while large truck accidents with release of hazardous materials cargo ranged from 385 to 552. The statistical rate of large-truck accidents involving hazardous cargo for miles traveled ranged from approximately 1 accident for every 714 million miles traveled in 2013 to approximately 1 accident for every 522 million miles traveled in 2016. Therefore, statistically, the rate of accidents on the nation’s highways involving crashes or spills of hazardous material cargo by large trucks is very low (FMCSA 2018).

Nationwide data from the Federal Motor Carrier Safety Administration website was obtained recently (FMCSA 2022). This information indicated that in 2019 (the latest data available by the FMCSA website) hazardous materials cargo carried by trucks was present in 3,885 total crashes and releases of the hazardous materials from their containers occurred in 671 of the crashes (FMCSA 2022). The most common cargo that was involved in crashes of hazardous materials transport was flammable liquids, accounting for 1,972 of the crashes. Recorded releases of flammable liquids occurred in 311 of the crashes. This category includes gasoline and fuel oils. Corrosives (including acids) were involved in 308 total crashes including 46 crashes where the cargo was released. Poisonous materials (including cyanide) were involved in 24 total crashes and only one of these involved a known release of the poisonous cargo.

This information shows that the most common type of hazardous material being transported is flammable material, which mostly consists of gasoline and fuel oil in bulk tanker trucks, and in about 16 percent of the crashes there was a release of the cargo. Crashes involving corrosives in transportation were six times less common than flammable liquids and about 15 percent of these crashes involved releases of the cargo. Again, these types of materials are commonly transported in bulk tanker trucks. It is notable that poisonous cargos were involved in only 24 total crashes and of these only one crash resulted in the release of the cargo.

Nationwide data from Federal Motor Carrier Safety Administration website (FMCSA 2022) shows that crashes involving large trucks in 2019 included 5,005 fatal crashes, 119,000 injury crashes, and 414,000 property damage crashes. Of these total incidents, about 418,000 of the crashes were the result of collisions with other vehicles, 47,211 crashes were collisions with fixed objects, and 14,287 crashes were rollovers. These data indicate that almost all accidents involving large trucks occur when driving on
public roads, collisions with fixed objects are much less frequent, and rollover accidents are a small percentage of the total (2.7 percent).

In 2019 there were a total of 38 spills of hazardous materials reported in the state of Idaho. None of these spills appear to be associated with a mine site or hauling of materials from a mine site. Most of the spills were from freight haulers and delivery services such as Fed Ex or United Parcel Service (accessed at https://portal.phmsa.dot.gov/analytics/saw.dll?Dashboard).

While national highways would be used to transport materials to the SGP as far as Cascade, Idaho, secondary roads would be used to make delivery into, or transport materials out of, the Operations Area Boundary and to the off-site facilities. Statistics for haul truck accidents on county roads and/or in mountainous terrain are very limited. Transportation of fuels and hazardous materials on the SGP access roads would be controlled with pilot vehicles and at lower speeds and with less traffic than highways and would likely be less prone to vehicle crashes than on the public highways.

However, the use of the SGP access roads do present additional hazards to vehicles such as: mountainous terrain, curves, rockfalls, reduced road widths, reduced sight distances, presence of wildlife, snow accumulations, avalanches, rock falls, falling trees, etc. These conditions could result in accidents related to vehicles encountering these other hazards. Perpetua would monitor conditions along the access roads and control transport of fuels and hazardous materials beyond the SGLF to reduce the effects of these other potential hazards.

Such accidents could cause spills of fuels or hazardous materials the environmental effects of which would depend upon the size of the spill, the material spilled, and proximity to flowing water. Perpetua has proposed spill control and countermeasures to reduce the effects of spills through responses with trained SGP personnel, equipment, and readily available spill response materials.

**Spill Responses**

Perpetua has prepared written spill response procedures described in their SGP Emergency Response Program (OHS-008) and SPCC Plan (OHSF-008K) that include:

- Emergency Call List and Contact Matrix (OHSF-008-A): Communication protocols for internal contacts for emergency notification and call matrices per incident type (e.g., spill, flood, fire, avalanche, etc.) for appropriate federal, state, and county agency reporting.

- Protection Systems and Response Equipment (OHSF-008-D): Identifies the locations of emergency response equipment and includes an inventory of available emergency response equipment at each location.

- Spill Plan (OHS-008-K): Provides emergency response protocols for employees and contractors in the event of spills. Includes directives for minor and major spill response, emergency contacts, reporting requirements for fuel spills/hazardous materials spills, contact numbers for environmental response contractor (Specialty Environmental Services), muster points, and emergency medical services contact information (i.e., Life Flight and Cascade Ambulance).
• Related plans include:
  – Critical Operations List (OHSR-008-C)
  – Evacuation Plan (OHSF-008-G)
  – HAZWOPER Program (OHSF-008-N)
  – Waste Determinations SOP (ESOP-021)
  – Herbicide Spill Response SOP (ESOP-024)

• For major hydrocarbon spills, areas of “flat water” in any adjacent waterways will be identified prior to material hauls in the event that booms need to be placed to capture major spills.

Spills at Mine Site and Off-Site SGP Facilities

A large volume release to the environment at the mine site or off-site facilities (SGLF, Burntlog Maintenance Facility) is not likely to occur based on the planned infrastructure specifically designed for the storage and management of hazardous materials and use of secondary containment. A copy of the SPCC plan would be kept at an appropriate on-site facility. Staff handling fuel or hazardous materials would be trained to successfully implement the SPCC plan. Inspections of the storage and handling areas would be conducted as specified in the SPCC plan and appropriate warning signs would be placed around storage facilities.

All contractors and company staff involved in handling oil and other chemicals would be made aware of the SPCC plan, spill kit locations, and appropriate emergency response procedures, and would be required to abide by all applicable federal, state, and local laws and regulations pertaining to their respective operations. Annual spill awareness/response training would be required for on-site personnel and suppliers/providers.

In the event a leak or spill was to occur, it would likely be relatively small in volume compared to the container volumes and would be promptly addressed by stopping the source of the spill, using absorbent material or barriers to prevent further migration of the spilled material, and removing, characterizing, and properly handling the cleanup wastes per implementation of the prescribed SPCC Plan and/or Emergency Response Plan recovery efforts.

The bulk petroleum and reagent storage facilities would be constructed with secondary containment systems in place. The tanks would be above ground and located within lined secondary containment facilities that would be capable of holding a minimum of 110 percent of the largest tank volume present within the containment. All process areas that include process liquids in tanks, vessels, or pipes would also include lined spill containment and collection sumps or ponds to retain any leaks or spills of process water or slurries. These materials would be recycled back into the process circuits without discharge to the environment.

Spills from transporters or mine equipment outside of secondary equipment at the site would be immediately responded to in order to limit effects to the immediate area of release and would therefore be local in geographic extent. Containment of any such spills to prevent migration of spilled material to flowing surface waters would be a maximum priority. Timely cleanup of any spilled materials and contaminated soils would reduce potential for longer-term contamination of surface water or groundwater.
A standard marine-type fuel containment boom (which would be of sufficient length for a worst-case discharge), spill prevention kit, and fire kit would be stored at the re-fueling site and would be readily available during off-loading of fuel from the fuel trucks or during re-fueling operations.

For these reasons, the overall direct and indirect effects of hazardous materials and other substances would depend on the location where a spill occurs and the amount and type of material released. For these reasons, possible spill-related impacts of fuels or hazardous materials to surface water, groundwater, and other physical resources from these facilities would be localized and low to negligible. Any effects would be temporary in duration, considering proper spill response measures, but the low risk of spills would be throughout the life of the SGP (long term).

**Spills on Access Roads**

The most probable release scenario associated with truck transport on the access routes to the SGP would be relatively small amounts of fuel spilled from vehicles themselves and attributed to mechanical failure or human error. Under this scenario, immediate cleanup actions would include deployment of containment and spill recovery materials, and removal of impacted soil. Fuel spilled to soils/roadbed could be readily contained and recovered, while fuel which enters waterways via roadside drainages may be difficult or impossible to fully recover and there would be potential for migration beyond the immediate spill area. Spill response materials on the vehicles and pre-positioned along the access routes and in SGP response vehicle would include materials to contain and recover floating oil. Response actions would include notification to the appropriate regulatory agencies.

Small volume release scenarios would be temporary due to prompt response and cleanup actions; however, higher volume/lower probability spill scenarios could result in longer-term remedial actions and impacts. The risk of spills would last throughout the life of the SGP (long term). Effects would generally be local and in close proximity to the release source in most scenarios; however, if surface or groundwater were to be impacted with fuels or other hazardous materials, the potential for migration beyond the local area could occur.

A low probability release of liquid petroleum or hazardous material from a bulk truckload could potentially occur assuming the puncture of the bulk tanker in the accident. Under this scenario, spilled material would be released to the immediate roadbed area, and potentially impact physical resources and ecological receptors (e.g., vegetation or wildlife) and nearby surface water depending on the topography and location. Spill response and recovery measures such as containment, deployment of absorbent materials, removal of impacted roadbed material and vegetation, and deployment of water-based spill recovery materials and equipment (as needed) would help to limit impacts.

A release of large quantities of solid hazardous materials such as cyanide or antimony concentrate would also be unlikely. Breaches of the shipping containers for these materials in the case of an accident could release the solid materials to the ground where it would reside until response actions are taken to mechanically clean it up, along with any contaminated soil. Migration of these solid materials from the immediate release site would be less likely than for liquid materials but could be possible in wet weather or snowmelt conditions. Again, spill response and recovery measures would help to limit impacts.
The pilot vehicles that would accompany all transports of fuel or hazardous materials between the SGLF and the Operations Area Boundary would carry spill response tools and materials, communications equipment, and drivers trained in spill responses. Thus, response to a small to moderate spill of fuel or hazardous material during transit over the SGP access roads would essentially be immediate.

Spill containment and countermeasures equipment and materials would be pre-positioned at the SGP mine site, Burntlog Maintenance Facility, and SGLF. In the event of a major spill requiring assistance from any of these locations, the radio communications between the pilot vehicles and these facilities would enable a timely response which would take an estimated 45 minutes to mobilize and arrive at the spill site.

Close proximity of access roads to surface water resources increases the potential for spilled material on the roadways to enter water, thus increasing the potential consequences of a spill. The Burntlog Route crosses 37 streams and includes 9 miles of road that are within 0.5 mile of surface water resources. The Johnson Creek Route crosses 43 different streams and includes 27 miles of road that are within 0.5 mile of surface water resources, including several miles that parallel the fish-bearing East Fork SFSR and Johnson Creek waterways. Though the Burntlog Route includes a greater number of stream crossings, the Johnson Creek Route includes significantly greater proximity to water resources. The potential consequences from trucking spills would thus be greater along the Johnson Creek Route that would be utilized during construction of the Burntlog Route.

**Closure and Reclamation**

Hazardous materials present at the mine site and off-site facilities during closure and reclamation would be similar in comparison to the construction phase of the SGP. However, most of the final closure and reclamation would be concentrated during May through November to avoid winter conditions. It is estimated that on average, one daily round trip to deliver fuel and miscellaneous supplies would occur during closure and reclamation. The risk of spills or releases would diminish throughout the closure and reclamation phase as fuel and other hazardous materials demands progressively diminish.

**Spill Impacts Throughout SGP Phases**

Mine transport begins on Warm Lake Road (CR 10-579) where the risk of spills would be lower, as it is paved and maintained by Valley County and has overall gentler grades with the exception of Big Creek Summit. At the intersection of Warm Lake Road and Johnson Creek Road (CR 10-413) the two mine access routes begin, with the Johnson Creek Route north along Johnson Creek Road (CR 10-413) and the Burntlog Route east onto Burnt Log Road (FR 447). The location of the spill risk would change as the SGP progresses under the 2021 MMP. Johnson Creek and the portion of the East Fork SFSR between the village of Yellow Pine and the Operations Area Boundary would be at risk of any significant spills of hazardous materials during the first 1 to 2 years of the SGP when the Johnson Creek Route would be used as the access route during the Burntlog Route construction. For the remainder of the mine life, the waterbodies along the Burntlog Route would be at risk from any significant spills.

The combination of the proposed monitoring, planning, and control practices described in the preceding narrative for transport and handling of fuels and hazardous materials and committed design measures would minimize the risk of accidental releases during the transportation, storage, management, and use of
hazardous materials. Nevertheless, the proximity of the access roads to surface water resources increases the potential for a release to enter water which could result in major consequences. The overall environmental impacts from potential releases of hazardous materials under the 2021 MMP would be localized, temporary, and minor to major depending on the type of material released and the location of the spill.

4.7.2.3 Johnson Creek Route Alternative

The Johnson Creek Route Alternative would use Johnson Creek Road for the long-term access route to the Operations Area Boundary and the Burntlog Route would not be constructed. The only differences between the two action alternatives related to hazardous materials would be the location of long-term access to the Operations Area Boundary. All other characteristics of hazardous materials matters would be the same for both alternatives.

The use, storage, and disposal of hazardous materials during the construction, operations, and closure and reclamation phases would be the same as those described for the 2021 MMP. However, the Johnson Creek Route has both a higher spill risk than the Burntlog Route due to increased presence of landslides, rockfalls, and avalanche paths, and higher potential consequences from a spill due to the route’s closer proximity to surface water resources, as discussed above. The overall environmental impacts from potential releases of hazardous materials under the Johnson Creek Route Alternative would be localized, temporary, and minor to major depending on the type of material released and the location of the spill with any releases to the creek being a major impact.

4.7.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and project design features (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Hazardous Materials.

4.7.4 Irreversible and Irretrievable Commitments of Public Resources

4.7.4.1 No Action Alternative

Under the No Action Alternative, no irreversible or irretrievable commitment of public resources or impacts are anticipated. However, if a spill were to affect a sensitive resource, an irretrievable impact could occur pending the recovery of the resource (i.e., soil, water, vegetation, or wildlife).

4.7.4.2 Action Alternatives

Under the 2021 MMP and Johnson Creek Route Alternative, no irreversible or irretrievable commitment of public resources or impacts are anticipated. However, if a spill were to affect a sensitive resource, an irretrievable impact could occur pending the recovery of the resource (i.e., soil, water, vegetation, or wildlife). Some impacts from hazardous materials spills and releases, such as any mortality to wildlife from the releases, would be irreversible.
4.7.5 Short-term Uses versus Long-term Productivity

4.7.5.1 No Action Alternative

Continued authorized exploration activities would result in potential short-term impacts to resources from the presence of hazardous materials in the area. Small spills would likely occur but would be cleaned up and managed in accordance with site practices and plans, and state and federal regulations.

4.7.5.2 Action Alternatives

Development of the 2021 MMP or Johnson Creek Route Alternative would result in potential short-term impacts to resources from the presence of hazardous materials in the area. Small spills would likely occur but would be cleaned up and managed in accordance with site practices and plans, and state and federal regulations. Residual contamination from previous mining and exploration efforts in the area would be addressed as they are encountered during the Action Alternative. Potential hazardous materials would be characterized for proper off-site disposal. Long-term positive impacts due to removal and proper disposal of residual and hazardous materials, habitat reclamation, and post- mining reclamation are anticipated to provide an overall long-term environmental benefit and improve the long-term productivity.

4.8 Surface Water and Groundwater Quantity

4.8.1 Impact Definitions and Effects Analysis Indicators and Methodology

The following indicators are applied for the analysis of water quantity:

- Stream flow characteristics (daily, seasonal, annual)
- The extent, magnitude, and duration of changes in groundwater levels

Analysis of surface water and groundwater quantity effects is guided by the following issues and indicators:

Issue: The SGP may cause changes in the quantity of surface water and groundwater in all drainages within the analysis area.

Indicators:

- Stream flow characteristics (daily, seasonal, annual).
- The extent, magnitude, and duration of changes in groundwater levels.

Issue: The SGP may affect water rights.

Indicators:

- Change in water rights availability in the SGP area.
- New water rights needed.
- Impacts to other water rights.
The surface water and groundwater quantity effects analysis primarily used information provided in the modeling reports prepared for the SGP by Perpetua, or their contractors (Brown and Caldwell 2017a, 2018a, 2021a, 2021b, 2021c, 2021d, 2021e; HDR 2017f; SPF 2017) but also included scientific literature. A more detailed description of the effects analysis may be found in the SGP Water Quantity Specialist Report (Forest Service 2022e).

The analysis for water rights was performed by gathering existing pertinent data related to surface water and groundwater resources, and existing and proposed water rights in the analysis area. The analysis then considered the timing, place of use, and impact of the proposed transfer of existing water rights and new water rights. The IDWR would determine if the water rights applications in the analysis area would impact downstream senior rights.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Surface water resource investigations for the SGP were initiated in 2012 to characterize existing conditions in the analysis area and continued through 2016. Baseline sampling has continued beyond 2016; however, characterization of surface waters’ baseline conditions draws from the data collected during a period from 2012 to 2016 and presented by Brown and Caldwell 2017a. The physical hydrologic conditions of the SGP study area are described in Section 3.8.4.

Several parties have investigated groundwater resources in the analysis area for the past 35 years. These investigations evaluated general groundwater hydrology and interaction between groundwater and surface water. A 2017 SPF Water Engineering Groundwater Hydrology Baseline Study report summarizes findings of those previous studies and presents the results of the newer hydrogeological investigations (SPF Water Engineering LLC [SPF] 2017).

Additionally, a Water Resources Summary Report summarizes hydrogeology-related work completed up to 2017 (Brown and Caldwell 2017a). The Water Resources Summary Report also provides information regarding IDWR well records for groundwater supply wells constructed in the analysis area.

From 2017 through 2021, Brown and Caldwell completed surface water and groundwater modeling and flow analysis (Brown and Caldwell 2018a, 2018b, 2021b, 2021e). These modeling efforts are summarized in this document with further details available in those references.

4.8.2 Direct and Indirect Effects

4.8.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua, and water resources would continue to be impacted by currently permitted Perpetua drilling activities for exploration. The continuation of approved exploration activities at the SGP by Perpetua would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip. Local minor withdrawals of surface water and groundwater to sustain the permitted exploration activities would continue.

Consequently, there would be little change in the current status of water quantity conditions at the SGP.
In January 2021, Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining wastes. Following these construction activities, the disturbed areas would be reclaimed with growth medium and revegetated to stabilize the sites in concert with the Reclamation and Closure Plan developed by Perpetua for the SGP. This work is planned to occur between 2022 and 2024. These activities are not anticipated to have noticeable impacts on water quantity in the SGP area.

4.8.2.2  2021 MMP

Water Resources Conceptualization

This section provides a summary of the methods used to evaluate the potential changes to groundwater elevations (drawdown) and surface water flows resulting from open pit mining, pumping the water supply wells, and utilizing surface water diversion at the proposed Project, predict the development of the West End pit lake projected to develop in the post-mining period, and evaluate potential drawdown impacts to surface water resources and water rights in the affected areas.

Several water models were utilized to predict water flow rates, volumes, quality and temperatures throughout the mine life, closure, and post-closure. These water models are inter-related as output from one model is used as input to another model (Figure 4.8-1; Brown and Caldwell 2021e). The meteoric water balance model (MWB) uses monthly meteorological data to provide groundwater recharge and surface water runoff volumes for the site-wide water balance model (SWWB, Brown and Caldwell 2021a) and the Stibnite hydrologic site model (SHSM, Brown and Caldwell 2021e). The SWWB evaluates operational consumptive use (e.g., mill water supply, dust control), TSF water volumes, and contact water volumes generated over the span of the project from construction through closure (Figure 4.8-2).

The SHSM simulates groundwater and surface water systems to forecast the pit dewatering rates and water supply diversions required for operations (Figure 4.8-3). The SHSM also forecasts the groundwater drawdown, effects on groundwater discharge to surface water and pit lake recharge associated with the dewatering and water supply diversions (Brown and Caldwell 2021e). Both the SWWB and SHSM provide input to the water chemistry and water temperature models described in the companion SGP Water Quality Specialist Report (Forest Service 2022f).

Watershed Drainage Effects

This section describes the direct effects of the SGP on surface water quantities in the analysis area. The indirect effects of groundwater pumping on surface streams are described under Groundwater Quantity.
Streams

The SGP is located within the upper reaches of the East Fork SFSR, and several perennial streams flow through the project site (Figure 3.8-1). The streams would be temporarily diverted around mine facilities from construction through closure to prevent generation of contact water (Brown and Caldwell 2021b). The stream diversions would divert stream flow and also capture stormwater runoff from areas upslope from mine facilities. These diversions would consist of:

- rock-cut channels along steep slopes in areas with shallow or at-surface bedrock,
- excavated earthen channels and berms constructed of alluvium,
- HDPE or steel pipelines, and
- the East Fork SFSR tunnel.

Pipelines and culverts would be used in areas where open channels are infeasible or ineffective such as steep hill slopes, road crossings, or underneath mine facilities, and for temperature control in the Meadow Creek diversion (Brown and Caldwell 2021b). Open channel diversion designs would incorporate:

- riprap lining for channels in erodible materials,
- geosynthetic lining for channels across fill or highly permeable materials, and
- gradients sufficient to ensure continuous flow at velocities allowable for the channel lining.

The East Fork SFSR currently flows through the existing Yellow Pine pit. Renewed mining activity would require temporarily diverting the East Fork SFSR to allow expansion, mining, backfilling, and reclamation of the pit. A tunnel would be constructed around the west side of the pit to divert the East Fork SFSR during operations and closure activities.

Properties of the East Fork SFSR tunnel design include:

- rock-cut, concrete-lined tunnel 15 feet wide by 15 feet high,
- sediment trap and debris collection at upstream portal,
- freshwater intake for mine water supply at upstream portal, and
- a transition zone for flow to native channel at the downstream portal.

Additional details regarding stream diversions and the East Fork SFSR tunnel are provided in the SGP Water Management Plan (Brown and Caldwell 2021b).
Figure 4.8-1
Water Quantity Conceptual Model

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021b)
**Figure 4.8-2**
Project Water Management Schematic Flow Diagram

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021b)
Figure 4.8-3
Mill Processing Water Requirements
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021b)
Stream diversion descriptions for the streams are summarized in Table 4.8-1. Unlike other streams, diversion of the East Fork of Meadow Creek (Blowout Creek) is not associated with proposed mining activity. This diversion would be associated with a voluntary restoration effort to create a stable, sustainable solution to the continual erosion and sediment loading resulting from the 1965 failure of a water storage dam in the upper East Fork of Meadow Creek valley.

**Table 4.8-1  SGP Stream Diversions**

<table>
<thead>
<tr>
<th>Stream</th>
<th>Diversion Length (miles)</th>
<th>Diversion Type</th>
<th>Discharge Location</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR</td>
<td>0.9</td>
<td>Tunnel</td>
<td>East Fork SFSR below Yellow Pine pit</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>Hennessy Creek</td>
<td>0.7</td>
<td>Pipeline</td>
<td>Fiddle Creek</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>Midnight Creek</td>
<td>0.3</td>
<td>Open channel with culverts</td>
<td>East Fork SFSR above the East Fork SFSR tunnel</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>West End Creek</td>
<td>1.5</td>
<td>Open channel</td>
<td>West End Creek below West End pit</td>
<td>Within West End pit</td>
</tr>
<tr>
<td>Fiddle Creek</td>
<td>0.2</td>
<td>Pipeline</td>
<td>Fiddle Creek below the GMS</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>Garnet Creek</td>
<td>0.2</td>
<td>Open channel with culverts</td>
<td>East Fork SFSR below plant site</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>Meadow Creek</td>
<td>2.0</td>
<td>Open channel</td>
<td>SODA diversion channel</td>
<td>Restored stream channel</td>
</tr>
<tr>
<td>EFMC (Blowout Creek)</td>
<td>-</td>
<td>Open channel</td>
<td>Lower Meadow Creek</td>
<td>Restored stream channel with water retention structures in meadow area</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021b

Streams would be routed into the diversions by temporary flow barriers, such as berms or cofferdams that redirect flows from the existing stream channel into the diversion channel. During closure, stream channels would be restored near their pre-mining locations using designed stream channels to cross reclaimed mine facilities. The East Fork SFSR tunnel openings would be sealed and the East Fork SFSR flow returned to a restored stream channel crossing the Yellow Pine pit backfill.

Designs for restored stream channels would incorporate as needed:

- open channels for surface water flow,
- meadow reaches,
- step pool reaches,
- cascade reaches,
- energy dissipation pools,
- reach transitions,
- small and larger woody debris structures, and
- riparian planting.

The portion of the restored stream channel across the backfilled Yellow Pine pit would incorporate an in-stream lacustrine feature (Stibnite Lake) analogous to the existing Yellow Pine pit lake, with the
exception that it is lined, to assist in emulating current flow and water temperature conditions (see Forest Service 2022f for more discussion of residence time and temperature conditions).

Therefore, use of stream diversions and subsequent stream restoration would modify the location of surface water flows. Flow rates would be affected by contact water capture, groundwater pumping, and surface water diversion as described below under **Surface Water Quantity**. The effects of stream diversions on water quantity would be moderate, long-term, and localized.

**Seeps and Springs**

Certain seeps and springs in the vicinity of proposed facilities have already been covered or disturbed by historical mining activities. Therefore, new direct impacts to these springs and seeps associated with surface disturbance from the proposed Project would not occur. Seeps and springs covered by facilities would be intercepted by facility underdrains that would collect flows and route them to pipelines for conveyance back to the ground surface. Indirect impacts to springs and seeps associated with groundwater pumping are described under **Groundwater Quantity**.

**Stormwater**

Stormwater diversions would be used to divert non-contact stormwater runoff around mine facilities and disturbed areas and would remain in place from facility construction through closure. Stormwater diversion designs would generally be the same as surface water diversions except pipelines would not be used and the need for geosynthetic liners would be less frequent.

Stormwater diversion outfalls would discharge to existing drainages and would incorporate BMPs such as sediment ponds, energy dissipation structures, or other erosion and sediment control measures.

**Contact Water**

Contact water is mine-impacted water that contacts disturbed areas and/or mine facilities with the potential to contribute sediment and dissolved constituents to surface water and groundwater without proper management. SGP contact water sources would include stormwater runoff and seepage from:

- legacy materials (e.g., Bradley tailings, Hecla heap, SODA),
- SGP haul roads,
- open pits,
- plant site and truck shop,
- TSF Buttress, and
- ore stockpiles.

In addition, groundwater produced by the dewatering system would be managed as contact water (Brown and Caldwell 2021b).

Runoff from haul roads and access roads outside the mine area is also considered contact water to be managed via BMPs applicable to those specific locations.
Contact water storage ponds would be used to provide temporary storage of contact water flows. The location of these storage ponds is constrained by topography, other proposed mine facilities, legacy materials, and near-surface groundwater levels. The ponds are also located to manage runoff in proximity to the water-generating areas.

Contact water ponds would be geomembrane-lined earthen facilities, equipped with emergency spillways and designed to contain runoff volumes associated with design storm runoff events (Table 4.8-2).

<table>
<thead>
<tr>
<th>Pond</th>
<th>Pond Capacity (excluding freeboard; acre-feet)</th>
<th>Design Storm Runoff (acre-feet)</th>
<th>Freeboard (feet)</th>
<th>Embankment Height (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hangar Flats Pond</td>
<td>201.8</td>
<td>33.9</td>
<td>3</td>
<td>35.0</td>
</tr>
<tr>
<td>Soda Pond</td>
<td>147.7</td>
<td>24.6</td>
<td>3</td>
<td>29.4</td>
</tr>
<tr>
<td>West End Pond</td>
<td>28.7</td>
<td>39.3¹</td>
<td>3</td>
<td>60.5</td>
</tr>
<tr>
<td>Midnight Pond</td>
<td>83.9</td>
<td>16.8</td>
<td>3</td>
<td>72.7</td>
</tr>
<tr>
<td>North Truck Shop Pond</td>
<td>3.2</td>
<td>3.2</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>South Truck Shop Pond</td>
<td>18.3</td>
<td>17.9</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>North Plant Pond</td>
<td>7.5</td>
<td>7.3</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>Central Plant Pond</td>
<td>4.3</td>
<td>4.3</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>Scout Pond</td>
<td>9.0</td>
<td>9.0</td>
<td>2</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021b, Table 6-2
¹West End Pond can contain the 100-year, 24-hour storm volume (25.8 acre-feet). Additional potential volume from snowmelt would be managed using in-pit sumps or pumping stored water from West End Pond to Midnight Pond or Yellow Pine pit.

n/a = not available

Additional details regarding the management of contact water are available in the SGP Water Management Plan (Brown and Caldwell 2021b).

Capture of contact water for consumptive use would reduce the volume of runoff and hence, stream flow by between 0 and 1,600 gpm with typical average capture rates of approximately 800 gpm during the first 6 years of processing as the site water inventory is built (Figure 4.8-3). Average capture rates for consumptive use decrease after year six as recycled water from the tailings facility fulfills a greater proportion of the process needs. This volume of capture represents a relatively small portion of overall flow rates in the East Fork SFSR which range annually between 20 cfs and more than 120 cfs (approximately 9,000 gpm to more than 54,000 gpm) near Yellow Pine, Idaho.

Contact water that is not used consumptively would be routed to the water treatment plant to achieve a water chemistry suitable for discharge to surface water in accordance with Idaho IPDES permit requirements. The effects of contact water management on surface water quantity would be moderate, long-term, and localized.
**Groundwater Quantity**

This section provides a summary of the methods used to evaluate the potential changes to groundwater elevations (drawdown) resulting from mine dewatering and pumping the water supply wells at the proposed Project, predicted development of a pit lake in the West End pit in the post-closure period, and evaluate potential drawdown impacts to surface water resources and water rights in the affected areas.

**Water Quantity Modeling of the Proposed Project**

The three proposed open pits and exploration decline would extend below the water table and, therefore, require systems to capture and remove groundwater that flows toward or into them as mining progresses. In addition, while not below the local water table, the East Fork SFSR tunnel would intercept inflows of groundwater in its vicinity. Water demands for ore processing would necessitate the installation of production wells and a surface water diversion from the East Fork SFSR, in addition to the dewatering system.

A calibrated three-dimensional numerical groundwater flow model was developed to estimate effects to groundwater and surface water resources from the proposed activity. Specifically, the groundwater flow model estimates: 1) dewatering rates for the open pit mines; 2) drawdown and groundwater levels resulting from dewatering and water supply pumping; 3) potential for pit lake development in the post-mining period; and 4) changes in groundwater discharge to stream flows.

The numerical groundwater model used the modeling code MODFLOW 6 and utilized Newton-Raphson numerical solver to simulate drying and wetting of model cells representing the groundwater system in response to dewatering and production well pumping plus seasonal recharge (Brown and Caldwell 2021e). The groundwater model domain encompassed approximately 48 square miles (six miles by eight miles), which included the analysis area (Figure 4.8-4). A detailed explanation of the conceptual hydrogeologic model, modeling approach and setup, steady-state and transient calibration, sensitivity analysis, water budget, and model predictions are presented in the groundwater model technical report (Brown and Caldwell 2021e).

The groundwater modeling included the development of a conceptual model of the groundwater flow systems. The conceptual model of the study consisted of three hydrogeologic categories based on groupings of geologic and stratigraphic units with similar hydraulic characteristics plus faults and fracture zones that act to inhibit or enable groundwater flow. In the analysis area, groundwater flows downhill from the mountainous areas toward the valley areas including the Meadow Creek Valley where most of the historical and proposed mining activities are located. Groundwater flow encounters the high angle MCFZ that inhibits bedrock flow from east to west creating local upward groundwater gradients on the eastern, uphill, side of the fault. After slowly migrating through the bedrock units and intervening fault structures, groundwater eventually discharges into the alluvial valley fill and subsequently into streams, departing the analysis area predominantly as surface flow.

No flow conditions were set around the perimeter of the model to represent inferred hydrologic divides associated with the mountain ridgetop topography. Modelled meteoric recharge to the groundwater system (Figure 4.8-5) was applied based on a water balance calculation that partitioned precipitation into recharge, runoff, and evaporation (Brown and Caldwell 2021e). Runoff and recharge estimates were
partitioned in unconsolidated dominated areas and bedrock dominated areas to allow differentiation between areas prone to recharge versus areas prone to runoff. This calculation resulted in relatively higher recharge rates in the alluvial valley bottoms as they received runoff from the surrounding mountainous areas.

Flows in surface streams were simulated using the MODFLOW 6 Surface Flow Routing (SFR) package. The SFR package models inflow or outflow from the stream grid cells depending on the cell’s modelled groundwater elevations at a rate associated with the cell’s stream bed conductance.

Model calibration was accomplished using a process that included simulation of pre-mining steady state conditions and then transient conditions associated with the pumping tests. The model was calibrated to water levels measured between 2011 and 2019 in 55 wells and piezometers plus flow rates at five stream locations by allowing the hydraulic conductivity values to vary within the range of the aquifer test results for each unit. The calibrated parameter values utilized for modeled hydrologic units are summarized in Table 4.8-3.

Table 4.8-3 Parameter Values for Modeled Hydrologic Units

<table>
<thead>
<tr>
<th>Hydrogeologic Unit</th>
<th>Hydraulic Conductivity (feet/day)</th>
<th>Vertical Anisotropy Ratio</th>
<th>Specific Yield</th>
<th>Specific Storage (1/feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium</td>
<td>12</td>
<td>10:1</td>
<td>0.20</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Alluvium-Bedrock Transition</td>
<td>0.2</td>
<td>1:1</td>
<td>0.04</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Shallow Idaho Batholith Bedrock</td>
<td>0.1</td>
<td>1:1</td>
<td>0.006</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Deep Idaho Batholith Bedrock</td>
<td>0.03</td>
<td>1:1</td>
<td>0.002</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Shallow Metasedimentary Bedrock</td>
<td>0.5</td>
<td>1:1</td>
<td>0.006</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Deep Metasedimentary Bedrock</td>
<td>0.15</td>
<td>1:1</td>
<td>0.002</td>
<td>1.0E-07</td>
</tr>
<tr>
<td>Meadow Creek Fault Zone</td>
<td>0.0001</td>
<td>1:1</td>
<td>0.025</td>
<td>1.0E-04</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021e

The calibrated model was used to estimate dewatering requirements to achieve dry mining conditions in the open pits, the magnitude and areal extent of drawdown resulting from dewatering and additional groundwater production required for process needs. The groundwater inflow into the pit areas would be pumped out for dewatering purposes by dewatering wells in the vicinity of the open pits and/or collection sumps within the pits.

The model predicts that dewatering requirements for the open pits would range from less than 0.2 cfs, approximately 100 gpm, in Mine Year 1 to approximately 5 cfs, approximately 2,200 gpm, in Mine Year 6 with an average rate of 2.75 cfs, approximately 1,250 gpm, over that six-year period. Figure 4.8-6 shows the estimated dewatering requirements over the active mining period for the Hangar Flats pit, Yellow Pine pit, and West End pit. Total dewatering rates would be the sum of the overlapping rates for these three pits. Total dewatering pumping rates would decrease to less than 1 cfs, approximately 450 gpm, during Mine Year 7 through the end of dewatering in the West End pit. These dewatering rates were based on the calibrated model’s hydraulic parameter values. A sensitivity analyses examining order of
magnitude changes in hydraulic parameter values was used to examine the range of likely dewatering rates (Section 4.8.2.4; Forest Service 2022e, Brown and Caldwell 2021h).

The calibrated model was used to estimate dewatering requirements to achieve dry mining conditions in the open pits, the magnitude and areal extent of drawdown resulting from dewatering and additional groundwater production required for process needs. The groundwater inflow into the pit areas would be pumped out for dewatering purposes by dewatering wells in the vicinity of the open pits and/or collection sumps within the pits.

The model predicts that dewatering requirements for the open pits would range from less than 0.2 cfs, approximately 100 gpm, in Mine Year 1 to approximately 5 cfs, approximately 2,200 gpm, in Mine Year 6 with an average rate of 2.75 cfs, approximately 1,250 gpm, over that six-year period. Figure 4.8-6 shows the estimated dewatering requirements over the active mining period for the Hangar Flats pit, Yellow Pine pit, and West End pit. Total dewatering rates would be the sum of the overlapping rates for these three pits. Total dewatering pumping rates would decrease to less than 1 cfs, approximately 450 gpm, during Mine Year 7 through the end of dewatering in the West End pit. These dewatering rates were based on the calibrated model’s hydraulic parameter values. A sensitivity analyses examining order of magnitude changes in hydraulic parameter values was used to examine the range of likely dewatering rates (Forest Service 2022e; Brown and Caldwell 2021h).

Impacts to Groundwater Levels

For this impact analysis, the area that is predicted to experience a change in groundwater elevation of ten feet or more is used for quantification and comparison of project effects and baseline conditions. The numerical groundwater flow model was not used to quantify changes in groundwater elevation of less than ten feet due to the scale of the model and unavoidable uncertainty associated with regional groundwater flow models. In addition, within the Analysis Area, changes in groundwater levels of less than ten feet can be difficult to distinguish from natural seasonal or annual fluctuations in groundwater levels.

Predicted dewatering rates and underdrain flows were combined with estimated volumes of mine-impacted waters from the SWWB to forecast the volume requirements for water treatment during operations and closure. Water treatment is required whenever the volume of produced groundwater plus mine-impacted waters exceeded the consumptive use demands for the project. Hence, the water treatment volume estimate represents the sum of predicted mine-impacted water values (e.g., dewatering production, contact water) less the consumptive use by the project (i.e., process water). These volumes ranged from 2,000 gpm during the years of highest dewatering production down to 150 gpm from the collection of mine-impacted waters post-closure (Figure 4.8-7). Estimates also included potential variability associated with meteoric conditions on the generation of contact water to develop potential contact water volumes associated with the range between the 5th and 95th percentiles of meteoric inputs based on historic measurements. The project water management system is designed with storage capacity for meteoric water events so that water destined for treatment can be contained until it can be transferred to the water treatment plant for constituent removal at the plant’s 2,000 gpm design rate. The installation of geosynthetic liner systems on the top surface of the TSF, TSF Buttress, Yellow Pine pit backfill, and Hangar Flats backfill inhibits the generation of contact water in the post-closure period plus drainage of
Figure 4.8-4 Groundwater Flow Model Domain and Model Grid

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a) Figure shows model cells in mine area but does not show entire model domain.
Figure 4.8-5
Groundwater Flow Model Recharge Zones

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a)
Figure 4.8-6 Predicted Dewatering Pumping Rates
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
Figure 4.8-7
Predicted Water Treatment Rate Requirements
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021b)
the water entrained in the TSF results in the abatement of contact water flows after approximately 40 years. Further details on the collection of waters for water treatment are located in the companion Water Quality Report (Forest Service 2022f).

Drawdown effects were predicted based on the net effect of pumping from pit dewatering wells and industrial supply wells. The maximum extent of alluvial groundwater drawdown in the Yellow Pine pit area is predicted to occur at the end of Mine Year 5 (Figure 4.8-8, Brown and Caldwell 2021e, 2021h). The cone of depression induced by dewatering of the Yellow Pine pit (and defined by drawdown greater than or equal to 10 feet) would extend to the Sugar Creek drainage to the north, to the topographic basin divide to the west, and approximately a half mile south of the pit. Maximum drawdown during operations is coincident with the pit bottom elevation (740 feet bgs). Water levels start recovering at the end of dewatering and re-inundate the pit area after around Mine Year 12. The extent of predicted drawdown cones was generally insensitive to variation in hydraulic parameters.

Alluvial drawdown near the West End pit along West End Creek would result from dewatering production and rerouting the creek around the pit. The maximum extent of drawdown from the West End pit activities would occur at the end of Mine Year 12, with a cone of depression extending approximately one mile to the north, east and south of the West End pit (Figure 4.8-8). The cone of depression also extended to the northeast into the Sugar Creek drainage. Maximum drawdown during operations is coincident with the pit bottom elevation (approximately 6200 feet amsl). Water levels start recovering at the end of dewatering and re-inundate the pit area around Mine Year 8.

Pit Lake Development

The numerical groundwater flow model developed for the proposed Project was used to predict the rate of recovery and pit lake development for the final West End pit configuration. Predicted lake filling would commence within the first year after the cessation of dewatering activities and would continue for approximately 40 years until the lake stage reaches near steady-state at an elevation of approximately 6600 feet amsl (Brown and Caldwell 2021e), resulting in a maximum pit lake depth of approximately 300 feet.
feet (Figure 4.8-9) with a ponded surface area of approximately 150 acres. The pit lake is not expected to overflow to the surface. Outflow from the pit lake would be in the form of subsurface outflow to groundwater. This effect is described in more detail in the companion SGP Water Quality Specialist Report (Forest Service 2022f).

Because they would be backfilled with development rock, pit lakes would not form in the Hangar Flats or Yellow Pine pits. Recovering water levels would inundate the portions of the backfill below the predewatering water levels around approximately Mine Years 8 and 12 years, respectively.

**Impacts to Groundwater Flow**

The presence of the fully lined TSF and TSF Buttress along with the lined Yellow Pine pit and Hangar Flats pit backfills would alter local groundwater recharge and flow permanently, as these liners would inhibit groundwater recharge across the areas of their footprints and thereby, increase surface water runoff from these areas while potentially lowering groundwater levels locally. The total covered area would be approximately 430 acres (Perpetua 2021a, Table 3-4) of a total basin area of 25 square miles (16,000 acres).

In addition, the underdrains for the TSF and TSF Buttress facilities would continue to function and locally lower groundwater levels beneath these facilities to the elevation of the drains. Therefore, groundwater flow away from this location would be reduced compared to baseline conditions because groundwater flow to the area would be partially converted to underdrain discharge.

Away from the TSF area, groundwater levels would rebound during the post closure period, with most recovery occurring within 3 years following the cessation of groundwater pumping (Brown and Caldwell 2021e). The groundwater flow pattern and flow directions are predicted to be only minimally affected by the presence of the West End pit lake, where the presence of the lake would result in a flat hydrologic gradient across the ponded area. Groundwater in areas away from the pit lake would return to stable conditions, with seasonal responses to recharge followed by lower winter water levels. The simulated groundwater levels and seasonal changes are similar to pre-mining conditions simulated by the existing conditions model.

Impacts to groundwater flow would be minor, permanent, and localized, as when mining and reclamation are completed, there would be minor reductions in groundwater flows due to local reductions in recharge in the vicinities of the TSF, TSF Embankment and Buttress, Hanger Flats pit backfill, and Yellow Pine pit backfill.
Figure 4.8-8
Predicted Dewatering Drawdown
Stibnite Gold Project
Stibnite, ID
Data Sources: Brown & Caldwell 2021a
Figure 4.8-9 Predicted Dewatering Drawdown
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
Impacts to Groundwater Dependent Ecosystems

As described above, mine-induced drawdown resulting from proposed dewatering and water production activities is predicted to cause a reduction in groundwater levels within the analysis area. These reductions are predicted to occur in the vicinity of existing seeps and springs plus the GDEs they support (Figure 4.8-10). These seep and spring locations can be characterized as either ephemeral or perennial. Ephemeral locations flow only during or after wet periods primarily in response to precipitation or runoff events. Thereby, these surface water features are not controlled by discharge from the regional groundwater system. During low precipitation periods of the year, ephemeral locations typically would be dry. In contrast, perennial seeps and springs generally flow throughout the year. Flows observed during wet periods include a combination of surface runoff and groundwater discharge, whereas flows during dry periods are sustained primarily by groundwater discharge. This groundwater discharge may emanate from a local system or from the regional groundwater system. If the flow from these seeps and springs relies on groundwater from an aquifer experiencing drawdown, that reduction in groundwater levels could reduce the surface water discharge resulting in potential reductions to the length of flow reach, rate of flow, and corresponding reduction in the associated riparian vegetation area.

Potential impacts to seeps, springs, and GDEs were evaluated by comparing surface water locations to the predicted ten-foot drawdown contour resulting from mine dewatering and water production. Figure 4.8-10 illustrates that there are 45 GDEs catalogued to be present within the analysis area potentially affected by dewatering drawdown of groundwater levels at the end of mining. During mining there are also 48 locations potentially affected by drawdown from the Hangar Flats pit dewatering and industrial well supply pumping. Such impacts would occur only in cases where the hydrology of the seeps, springs, and wetlands affected is dominated, or largely influenced by groundwater discharge from the aquifer where water levels are subject to drawdown. The actual impact to each specific seep or spring would depend on the degree of interconnection between that perennial surface water and the aquifer affected by mine-related pumping. Considering the complexity of hydrogeologic conditions and the inherent uncertainty in numerical modeling predictions relative to the exact areal extent of groundwater drawdown, conclusive a priori identification of specific seep and spring impacts is not possible. Therefore, a precautionary principle is applied where seep and spring locations within the vicinity of the predicted drawdown would be subject to monitoring and mitigation requirements (see Section 4.8.3).

Impacts to GDEs would be negligible to potentially major, long-term, and localized.

Impacts to Groundwater Rights

There are no groundwater rights located within the predicted ten-foot drawdown contour associated with the drawdown prediction for mining activity. Current Perpetua groundwater rights are located outside of the predicted dewatering impact areas.

Additional groundwater rights would be needed for the SGP and would be secured through direct permit application for approval of such rights from the IDWR. Perpetua plans to apply for a maximum total diversion rate of 9.6 cfs to maintain ore processing and mine operations. This rate would be for combined groundwater and surface water diversion in addition to existing water rights. Perpetua is currently in the process of applying for these additional rights.
Groundwater use for potable water supply would require drilling wells at the Landmark Maintenance Facility and SGLF. At each facility, a well with a capacity of 18 gpm (0.04 cfs) is proposed. Separate water rights applications would be submitted for each well, seeking a permit to authorize diversion of 0.04 cfs for domestic and industrial purposes at the Landmark Maintenance Facility, and a permit authorizing diversion of 0.04 cfs for domestic and commercial purposes at the SGLF.

Domestic water use at the truck shop and mill facilities also would be supplied from a potable water system. Perpetua anticipates submitting an application for permit seeking 0.06 cfs of groundwater for this use.

Domestic use at the Worker Housing Facility also would be supplied by groundwater. The authorized point of diversion for water right 77-7141 (0.20 cfs) would be modified for this purpose through an application for transfer. In addition, Perpetua anticipates submitting an application for permit to appropriate and additional 0.20 cfs of groundwater to supplement the currently authorized 0.2 cfs volume authorized under 77-7141.

The effects of groundwater diversion at these rates were incorporated into the impact analyses above.

**Surface Water Quantity**

This section provides a summary of the methods used to evaluate the potential changes to stream flows and surface water rights in the affected areas. The primary focus of the effects analysis is on predicted stream flows in Meadow Creek between the TSF and Hangar Flats pit; Meadow Creek downstream of the Hangar Flats diversion but upstream of the confluence with the East Fork SFSR; the East Fork SFSR at USGS Gaging Stations 13310800, 13311000, and 13311250; the East Fork SFSR downstream of Sugar Creek; and Sugar Creek at the USGS Gaging Station 13311450.

**Changes in Stream Flow Characteristics**

The changes in surface water flow described in this section are compared to those of the simulated existing conditions. Changes in surface water flows in the analysis area are expected to result primarily from:

- Stream diversion around mine facilities,
- Interception of contact water and other mine-impacted water prior to runoff,
- Development and dewatering of three open pits,
- Groundwater production for consumptive use,
- Stream water diversion above the East Fork SFSR tunnel for consumptive use, and
- Discharge of treated water.

These activities have the potential to modify the location and flow rate of stream flows in the analysis area.
Figure 4.8-10
Predicted Groundwater Drawdown in the Vicinity of Groundwater Dependent Ecosystems
Stibnite Gold Project
Stibnite, ID

Base Layer: Midas Hillshade Raster 10m
Other Data Sources: Perpetua; Boise National Forest; Payette National Forest

LEGEND
- Seep/Spring
- SHSM Drawdown Maximum Contour
- Intermittent Stream
- Perennial Stream
- Delineated Wetland

Project Components *
- Mine Footprint (Mine Year 12)

*Mine Site components are associated with 2021 MMP
Streamflow simulations were performed for various locations potentially affected by mine operations, including locations of the USGS gaging stations in the analysis area (Figure 3.8-3). Stream flows are represented graphically in this report with numerical tabulations of the predicted stream flows available in the appendices to Brown and Caldwell 2021e.

Stream flows in Meadow Creek and East Fork SFSR upgradient of the mine activities would not be affected by the operations because these areas are outside the influence of mine disturbance and dewatering. Predicted monthly changes in stream flows are summarized in Table 4.8-4.

The model predicts reductions in Meadow Creek flows between the TSF and Hangar Flats pit compared to baseline flows of up to approximately 40 percent during low flow periods (Figure 4.8-11) which depicts the predicted monthly surface flows for the project compared to No Action case during the construction and operational period for the SGP. This point of comparison is not associated with a stream gauge location because the current Meadow Creek gauge location would be displaced by construction of the TSF. This section of Meadow Creek is simulated as lined, preventing groundwater from discharging to the creek. However, baseflow depletion is largely offset by the addition of treated water in this portion of Meadow Creek via an IPDES permitted outfall. This offset is anticipated to be substantially effective because the predicted impact is primarily associated with dewatering of the Hangar Flats pit. Therefore, that dewatering is contemporary with the greatest availability of treated water around Mine Years 5 and 6, as dewatering production is a contributing source to the water treatment requirement for that time.

Table 4.8-4 Average Monthly Percent Predicted Reductions in Stream Flows during the Mine Operations Period

<table>
<thead>
<tr>
<th>Month</th>
<th>East Fork SFSR above Meadow Creek (13310800)</th>
<th>East Fork SFSR below Meadow Creek (13311000)</th>
<th>East Fork SFSR above Sugar Creek (13311250)</th>
<th>Sugar Creek above East Fork SFSR (13311450)</th>
<th>East Fork SFSR below Sugar Creek (13311500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>-</td>
<td>7%</td>
<td>13%</td>
<td>3%</td>
<td>9%</td>
</tr>
<tr>
<td>February</td>
<td>1%</td>
<td>6%</td>
<td>13%</td>
<td>3%</td>
<td>9%</td>
</tr>
<tr>
<td>March</td>
<td>-</td>
<td>5%</td>
<td>12%</td>
<td>3%</td>
<td>8%</td>
</tr>
<tr>
<td>April</td>
<td>-</td>
<td>6%</td>
<td>8%</td>
<td>2%</td>
<td>6%</td>
</tr>
<tr>
<td>May</td>
<td>-</td>
<td>4%</td>
<td>4%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>June</td>
<td>-</td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>July</td>
<td>-</td>
<td>7%</td>
<td>14%</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>August</td>
<td>-</td>
<td>9%</td>
<td>18%</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>September</td>
<td>-</td>
<td>7%</td>
<td>15%</td>
<td>3%</td>
<td>11%</td>
</tr>
<tr>
<td>October</td>
<td>-</td>
<td>7%</td>
<td>15%</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>November</td>
<td>-</td>
<td>7%</td>
<td>15%</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>December</td>
<td>-</td>
<td>6%</td>
<td>13%</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>Maximum Monthly Reduction</td>
<td>3% (end of Mine Year 6)</td>
<td>26% (start of Mine Year 7)</td>
<td>30% (end of Mine Year 1, start of Mine Year 7)</td>
<td>3% (Mine Year 12)</td>
<td>3% (end of Mine Year 1, start of Mine Year 7)</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021e, Appendix B (predicted flows in CFS and relative percentage differences)
- indicates a less than 1% change
Effects to both seasonal peak and low flows are noted for Meadow Creek below the Hangar Flats diversion, but above the East Fork SFSR (Figure 4.8-12). Minimum flows under the No Action Alternative are approximately 4.9 cfs, compared to 2.9 cfs for the action alternatives (a 40 percent reduction) related to Hangar Flats dewatering interception of groundwater as simulated by the mine operational period model (Brown and Caldwell 2021e). Flow reductions are predicted during the project’s operational period with the largest flow reductions (i.e., on the order of 40 percent) occurring during Mine Years 4 through 8 as Hangar Flats pit is being dewatered. Flows recover toward the No Action Alternative condition following the cessation of Hanger Flats dewatering and are near equivalent to the No Action Alternative conditions by Mine Year 12.

Below the confluence of Meadow Creek and East Fork SFSR and in the East Fork SFSR above the confluence with Sugar Creek, late-season stream flow decreases would occur under average climate conditions during the mine operational period (Figures 4.8-13 and 4.8-14). Upstream of the Yellow Pine pit area, minimum baseflows based on comparison of model results to the existing conditions model for the action alternatives would be approximately 6.6 cfs compared to 8.9 cfs (26 percent reduction) for the No Action Alternative attributable to the diversion and capture (contact water) of surface water as well as mine dewatering. Downstream of the Yellow Pine pit area prior to the confluence with Sugar Creek, minimum baseflows for the action alternatives are predicted to be 7.9 cfs compared to 11.3 cfs under the No Action (30 percent reduction) under the proposed water management scenario and its associated water balance (Brown and Caldwell 2021e). These reductions are predicted to occur during the project operational period with the largest reductions occurring during the Mine Years 2 through 8 when dewatering product at Yellow Pine pit and then Hangar Flats pit are at their peak rates. Flows recover toward the No Action Alternative condition at the end of mine operations and are near equivalent to the No Action Alternative conditions by Mine Year 12.

Predicted Sugar Creek flows for the action alternatives are approximately 3 percent less than the No Action Alternative during the operational period (Figure 4.8-15). During the post-closure period when the West End pit lake is forming, predicted Sugar Creek flows decrease by up to 9 percent primarily. Predicted flow reductions of this size persist for approximately 50 years post-closure before decreasing to an approximately 1 percent difference indefinitely compared to the No Action Alternative. Downstream of the East Fork SFSR and Sugar Creek confluence, the average seasonal low flows for the action alternatives are 20.1 cfs compared to 22.1 cfs under the No Action Alternative (9 percent reduction), while the minimum predicted low flow is 15.7 cfs compared to 18.2 cfs (14 percent reduction, Figures 4.8-16 and 4.8-17). These reductions are attributable to the total of upstream capture of surface water, groundwater dewatering, and water abstraction for consumptive use partially offset by discharge of treated water. Flows fully recover within 10 years from cessation of operations (Brown and Caldwell 2021e).

It appears that the predicted reduction in stream flows due to the SGP are most pronounced within lower Meadow Creek above East Fork SFSR and East Fork SFSR above Sugar Creek. The percentage decrease in base flows is moderated by the flow from Sugar Creek. Farther downstream of the confluence of East Fork SFSR and Sugar Creek, flow reductions are expected to decrease due to incremental inflows of surface water and groundwater along the downstream run of the river that are not impacted by the SGP (e.g., Salt Creek, Profile Creek, Johnson Creek, and others) with predicted flow reductions in the project area equivalent to less than one percent of mean flows downstream of the confluence with Johnson Creek.
Figure 4.8-11
Comparison of No Action and Action
Alternatives Predicted Meadow Creek Flow between the
TSF Buttress and Hangar Flats Pit
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021b)
Figure 4.8-12
Comparison of No Action and Action Alternatives Predicted Meadow Creek Flow above EFSFSR Confluence
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021b)
Figure 4.8-13
Comparison of No Action and Action Alternatives Predicted EFSFSR Flow below Meadow Creek Confluence

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021b)
Figure 4.8-14
Comparison of No Action and Action Alternatives Predicted EFSFSR Flow above Sugar Creek Confluence

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021b)
Figure 4.8-15
Comparison of No Action and Action Alternatives Predicted EFSFSR Flow above Sugar Creek Confluence

Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
Figure 4.8-16
Comparison of No Action and Action Alternatives Predicted EFSFSR Flow below Sugar Creek Confluence

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a)
Figure 4.8-17
Comparison of No Action and Action Alternatives Predicted EFSFSR Flow below Sugar Creek Confluence in the Post-Closure Period

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a)
The effects of changes in stream flow characteristics on ecological receptors are described in Sections 4.12.2 and 4.13.2 plus companion specialists reports for Wildlife (Forest Service 2022j) and Fish and Aquatic Resources (Forest Service 2022i).

Impacts to stream flow characteristics would be moderate, long-term, and localized.

**Impacts to Surface Water Rights**

There are no surface water rights located within the analysis area other than Perpetua's.

Additional surface water rights would be needed for the SGP and would be secured through direct permit application for approval of such rights from the IDWR. Perpetua plans to apply for a maximum total diversion rate of 9.6 cfs to maintain ore processing and mine operations. This rate would be for combined groundwater and surface water diversion in addition to existing water rights. Actual production at the maximum rate would be uncommon and limited in duration. Typical rates of surface water diversion during the build-up of project water inventory would be approximately 4 cfs.

It should be noted that no water right with a junior priority date can deplete the water needed to maintain the IWRB maintained minimum streamflow water right on the East Fork SFSR (Water Right 77-14190), unless allowed as a condition of approval of the proposed junior water right. All the existing water rights at the SGP predate the priority date of April 1, 2005, associated with Water Right 77-14190. Any new water rights permits would have a junior priority date, but the minimum stream right (77-14190) on the East Fork SFSR is subordinate to all future domestic, commercial, municipal, and industrial uses, and up to 8.2 cfs of new non-domestic, commercial, municipal, and industrial uses. This would allow authorization of up to 8.2 cfs of new non-domestic, commercial, municipal and industrial water rights to which Water Right 77-14190 would be subordinate.

Base flows in the East Fork SFSR below Sugar Creek are approximately 20 cfs and 60 cfs in Johnson Creek (at gauge location 13313000). The maximum diversion rate under existing and proposed surface water rights is 4.05 cfs, which is approximately 20 percent of the base flow in the East Fork SFSR and five percent of the combined flows of the East Fork SFSR and Johnson Creek.

After a water right application has been filed, IDWR would perform an analysis to determine if the application is made in good faith with sufficient financial resources to complete the project, would reduce the quantity of water under existing rights (including Minimum Stream Flow and Wild & Scenic water rights on the South Fork Salmon River and the Salmon River), would be insufficient for the proposed use, and would not conflict with the local public interest. Instream rights on the SFSR are subordinate to 20.6 cfs; maximum diversions proposed by Perpetua from all sources and uses would be 9.68 cfs, within the allowance of the SFSR instream rights.

Minimum instream flow in the Federal Reserve Water Rights for the Salmon WSR (75-13316 and 77-11941) at their designated location approximately 64 miles downstream from the SGP area range from 1,200 cfs in early September to 9,450 cfs in early June. IDWR would be responsible for determining the impacts of the water right application. The current seasonal low baseflow in the Salmon River is approximately 4,150 cfs near Shoup gage.
Impacts to surface water rights would be addressed by the water rights authorizations as determined by IDWR via mitigation measures associated with those authorizations. Pending application of the IDWR mitigation measures, effects on surface water rights would be moderate, long-term, and localized.

4.8.2.3 Johnson Creek Route Alternative

The water quantity related impacts associated with the 2021 MMP and Johnson Creek Route alternatives are identical. Water for dust control on access roads would be obtained from permitted freshwater sources. The relative sourcing of dust control water from permitted diversion locations would vary depending on access route but would remain within the authorized diversions (e.g., off-site maintenance facilities, on-site freshwater sources).

4.8.2.4 Uncertainty Associated with Model Predictions

Predictions generated by groundwater and hydrologic models are associated with a degree of uncertainty. General sources of model uncertainty are attributed to a variety of factors, including:

- data characterizing hydraulic properties (over a large enough area), or the hydrologic system’s response to changes or stressors on which the model predictions depend;
- conceptual models or model assumptions;
- geometrical representation of a complex system and its heterogeneities;
- variation in the drawdown associated with specific dewatering well and dewatering sump locations and designs as represented in the numerical model by drains;
- impreciseness of spatial interpolations;
- field measurement inaccuracies;
- inadequate interpretation of the collected data;
- misinterpretation of relevant processes that affect the hydrologic system;
- general limitations of the models and numerical methods used; and
- unpredictable natural and human factors.

Uncertainties associated with model predictions can be evaluated and assessed using a variety of approaches, including:

- Sensitivity analysis;
- “Bayesian model averaging” applied to multiple conceptual models and multiple parameter estimation methods;
- Parallel testing of several viable conceptual models, combined with parametric uncertainty analysis carried out for each conceptual model;
- The use of “pilot points” in conjunction with nonlinear parameter estimation software that incorporates advanced regularization functionality;
- “Calibration-Constrained Monte-Carlo,” also called “Null Space Monte Carlo;” and/or
- “Subspace Monte Carlo” that allows calibration-constrained random heterogeneity.

Sensitivity analysis is deemed an important part of model uncertainty analysis. Most often such analysis is limited to varying model parameters and noting how such changes affect the model calibration.
However, sensitivity analysis alone is not always adequate if the altered model is used for making predictions. This is because varying the values of model parameters often results in a significant model “de-calibration,” and de-calibrated models should not be used for predictive simulations.

ASTM International Standard Guide for Conducting Sensitivity Analysis for a Groundwater Flow Model Application (ASTM International 2008) provides the following clear instructions: “For each value of each group of inputs, rerun the calibration and prediction runs [emphasis added] of the model with the new value of the calibrated value” – this means that after varying the value of a given parameter, one needs to calibrate the altered model, before using it for making predictions. This is seldom accomplished with the models developed for industrial applications – completing such systematic analysis would require large budgets and a significant level of effort that many projects cannot support.

Many of the other, more sophisticated approaches listed above for evaluating model uncertainty can be quite involved and, due to limitations of software and hardware, combined with the budgetary and time constraints of most projects, are still not practical outside of the realm of research (Rzepecki 2012).

Parameter value selection for the hydraulic characteristics simulated in the SGP hydrologic model is the primary source of uncertainty in predicting pumping rates associated with open pit dewatering and the nature and extent of potential impacts from project pumping and water management. In particular, the selection of parameter values to represent the bedrock aquifer hydraulic characteristics are important because bedrock-hosted groundwater is extensively present throughout the Analysis Area.

To address this source of predictive uncertainty for groundwater pumping and its impacts, a sensitivity analysis was performed on the parameter values selected for bedrock hydraulic properties. Model parameter values for hydraulic conductivity and specific storage were evaluated over a range of numerical values within the range of measurements observed during borehole testing. A range of bedrock hydraulic conductivity values between 0.02 and 50 times the model selected values and bedrock specific storage values between 0.5 and 2 times the model selected values were examined. Additional details of the sensitivity analysis are described in Brown and Caldwell 2021e. Parameter value changes by more than a factor of 10 produced a model that did not calibrate to observed conditions. Therefore, the following discussion of sensitivity results relates to a range of bedrock hydraulic conductivity values between 0.02 and 10 times the model selected values.

Dewatering pumping rate predictions were sensitive to increases in bedrock hydraulic conductivity but were insensitive to decreases in bedrock hydraulic conductivity or changes in specific storage. For the Yellow Pine pit dewatering, peak pumping rates associated with the sensitivity analysis ranged up to approximately 2,000 gpm compared to the model predicted rate of approximately 650 gpm. For Hangar Flats pit and West End pit dewatering, the sensitivity analysis peak pumping rate ranged up to approximately 2,400 gpm compared to a predicted value of approximately 1,500 gpm, and approximately 400 gpm compared to 300 gpm, respectively.

If higher than predicted dewatering pumping rates within the sensitivity range were in fact realized, the project would be less reliant on surface water abstraction from the intake above the EFSFSR tunnel or production from groundwater industrial supply wells to meet its consumptive use needs. Therefore, increases in dewatering pumping would be less than the increase in total groundwater pumping by the
project because dewatering production could be used to source more of the consumptive use, offsetting pumping from industrial supply wells. However, the increase in total pumping due to increased bedrock hydraulic conductivity only slightly affected the lateral extent of the 10-foot drawdown cone compared to model predictions because that extent is more closely related to drawdown in the more permeable alluvial materials (Brown and Caldwell 2018a, 2021b, 2021e).

With regard to surface waters, the effects of increased groundwater pumping would be largely offset by the associated reduction in surface water abstraction from the intake above the East Fork SFSR tunnel for consumptive use. Therefore, surface water flow rates would be within 0.5 cfs of those predicted by the model, representing the difference between predicted surface flow rate reductions and removing the rate of forecasted withdrawal from the intake above the EFSFSR tunnel, which would no longer be needed. Conversely, decreased dewatering pumping would create a need for more industrial well production or surface water abstraction.

Groundwater modeling requires simplifying assumptions to represent a complex subsurface hydrologic regime. As a result of data limitations and simplifying assumptions, all predictive models, no matter how well constructed and calibrated, contain uncertainty. The main sources of uncertainty for the Brown and Caldwell model are:

- Typical limitations of data derived from localized, short-term hydraulic tests to characterize an aquifer at a field-scale;
- Predictive sensitivity to various possible degrees of hydraulic transmissivity of the fault zones, only one of which has been explicitly represented in the model; and
- Putative inability to directly observe the effects of long-term hydraulic stresses on the bedrock aquifer as attempted deep bedrock pumping tests have not been completed due to the inability to sustain groundwater production from a pumping well.

Although alternative conceptual and numerical models likely could be developed, an undertaking of this magnitude is not realistic, and in any case, would have been unlikely to produce significantly different predictive results or to significantly reduce the uncertainties associated with the model predictions.

### 4.8.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. The mitigation measures described below in addition to the Forest Service requirements and EDFs (Section 2.4.9) have been accounted for in the preceding impact analysis.

**Issue:** Mine-induced drawdown of water levels could impact flows in springs that were hydrologically connected with the aquifer.

**Monitoring Measure - Water Resource Monitoring Plan Implementation:** Because construction, operation, and closure of the SGP has the potential to impact surface or groundwater resources. A focused water resources monitoring plan for the proposed operations would be implemented by the proponent. The mine owner/operator would be responsible for the implementation of a Water Resources Monitoring Plan.
Plan focused on confirming the predicted groundwater drawdown within allowance for model uncertainty and its relationship to discharges at proximal surface water resources. The plan would include surface water, groundwater, and meteorological monitoring requirements for the approved project. Water quantity measurements would include diversion rates from groundwater pumping, water levels in groundwater monitoring wells and piezometers located within the Operations Area Boundary, and flow rates of streams and springs at USGS monitoring stations as well as spring locations characterized in the baseline program within the predicted 10-foot drawdown contour. Monitoring results would be provided to the Forest Service on a quarterly basis and summarized in an annual report. The mine owner/operator would be responsible for continued monitoring and reporting of changes in groundwater levels and surface water flows prior to, and during, operation and for a period of time in the post-reclamation period. The plan would be reviewed and approved by Forest Service and implemented prior to the commencement of mining. State authorizations may also have monitoring requirements and these requirements along with monitoring already conducted or proposed could be applied to satisfy the needs of this mitigation measure.

**Effectiveness:** This monitoring measure would provide for identification of potential flow-related impacts that deviate outside uncertainty of model forecasts to groundwater and surface water resources as a result of mine-related water management activities. Implementation of this monitoring measure in conjunction with associated mitigation measures is anticipated to mitigate potential adverse impacts to surface water resources resulting from mine-related drawdown during the mining and post-mining period. If such deviation is observed, actions may consist of additional investigation and evaluation, including additional monitoring as necessary, to determine effective management practices and prevent adverse impacts.

**Issue:** Despite the best efforts at calibration and validation, predictive modeling of groundwater flow and stream flow entails uncertainty and future field conditions may vary from predictions.

**Monitoring Measure - Groundwater Modeling Validation and Update:** Since there is uncertainty in the numerical groundwater model developed for the project, a work plan would be developed to revise the model and update it as necessary 1 year after mining intercepts the groundwater table and then again whenever monitoring data demonstrates a change in conditions that would significantly influence prediction and recognition of potential mine impacts. The model update would be based on the actual observed changes in groundwater elevations and additional hydrogeologic or groundwater-related data collected during operation. The Forest Service’s annual review of monitoring results combined with the updated groundwater modeling, if necessary, would provide early warning of potentially unanticipated, undesirable impacts to water resources to allow for implementation of appropriate mitigation measures.

**Effectiveness:** Implementation of this monitoring measure is expected to be effective in sustaining predictive models as usable evaluation tools that reflect site conditions and monitoring data for the purpose of predicting impacts and developing effective management practices.
4.8.4 Irreversible and Irretrievable Commitments of Public Resources

4.8.4.1 No Action Alternative

Under the No Action Alternative, the current mine plan would not be approved and the mining activities proposed under it would not take place. Perpetua could still propose to exercise its mining rights in the future. Under the No Action Alternative, no change would occur in the current surface water and groundwater flow conditions in the analysis area, and no change to the current commitment of these resources would occur. Therefore, there would be no irreversible or irretrievable commitments of water resources beyond those already realized as a consequence of historical mining activities conducted within the analysis area.

4.8.4.2 Action Alternatives

Surface water, in terms of its flow rate characteristics, is a renewable resource, and therefore the action alternatives are not expected to have permanent flow impacts. The duration of the predicted impacts on streamflow includes the mine construction and operational period, and up to another 10 years through the post closure period, before returning to a stable, long-term seasonal pattern under natural conditions.

Impacts to surface stream flow rates from the SGP would be irretrievable commitments of these resources.

However, the SGP would irreversibly alter the terrain of the analysis area by the development of the TSF, by eliminating the existing Yellow Pine pit lake (and reconstructing the East Fork SFSR through its present location), while creating a pit lake at West End and the Stibnite Lake feature atop the backfilled and reclaimed Yellow Pine pit.

Meadow Creek would be routed over the reclaimed TSF with its natural flow rate but its gradient would be permanently altered over the TSF. The seeps and springs under the TSF that would be collected and routed out from under the site within pipes would be permanently carried by these systems. These would be irreversible commitments of these resources.

Mining of ore would result in the formation of mine pits, which would fill during a post closure period, forming inundated pit backfills in the Yellow Pine and Hangar Flat pits and a pit lake in the West End pit. The Yellow Pine, Hangar Flats, and existing Midnight pits would be backfilled with development rock to reduce the amount of development rock placed in surface DRSFs and facilitate reclamation of the East Fork SFSR. Mining of the pits and filling them with rock would result in the groundwater system achieving a new flow regime through the rock backfill instead of the baseline aquifer conditions but the groundwater levels in the backfills are expected to reach approximate baseline elevations as influenced by the revised groundwater flow in the backfills. These would be irreversible commitments of the groundwater system in these locations.

The West End pit lake would be situated primarily in bedrock and therefore would not receive substantial groundwater inflows. Model simulations show that the primary sources of water for filling the lake are direct precipitation and surface water runoff. The lake is predicted to fill slowly over 41 years, with a seasonal pattern of increased lake stage from spring runoff followed by seasonal declines as water flushes through
evaporates and flows from the lake back into local bedrock groundwater (Brown and Caldwell 2018b, 2021a, 2021b).

Long-term, groundwater levels would be locally affected by the geosynthetic covers that would be placed over the TSF and TSF Buttress during closure activities plus the geosynthetic covers placed over the Yellow Pine pit and Hangar Flats pit backfills. These covers are intended to significantly reduce infiltration of recharge from precipitation which would permanently limit groundwater recharge rates over the areas covered by these liners. In these areas, precipitation would not recharge groundwater but instead would remain in the shallow subsurface where it would be available for evapotranspiration and discharge to surface water in the East Fork SFSR. This would be an irreversible commitment of the groundwater resource in these locations.

4.8.5 Short-term Uses versus Long-term Productivity

4.8.5.1 No Action Alternative

Under the No Action Alternative, SGP activities would not be implemented. Consequently, no short-term use would occur that would affect surface water or groundwater quantity, and no change in long-term productivity would occur.

4.8.5.2 Action Alternatives

Implementation of the SGP would result in long-term impacts to surface water quantity at the SGP through groundwater withdrawal and stream diversions. The duration of predicted impacts on streamflow includes the mine operational period, and the early post-closure period. After that period, the system would return to a stable seasonal pattern similar to existing conditions.

Apart from triggering some changes in groundwater quality characteristics (Forest Service 2022f), implementation of the action alternatives would potentially have indirect effects on surface water discharges associated with changes in groundwater levels. Post-mining, groundwater wells could still be installed within the SGP area and used to produce groundwater at rates similar to those under existing conditions. Saturated thickness of alluvial deposits and their groundwater transmissive properties would remain similar to baseline conditions except in the three open pit areas where the alluvial deposits were removed during the mining period.

4.9 Surface Water and Groundwater Quality

4.9.1 Impact Definitions and Effects Analysis Indicators and Methodology

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1. Analysis of water quality impacts utilizes a comparison of predicted analyte concentrations to regulatory standards (Table 3.9-1). These standards are developed to be protective human and wildlife water users. Human health and wildlife implications of the predicted analyte concentrations relative to regulatory standards and existing conditions are included in analyses of public health & safety and the Fisheries and Aquatic Habitat Special Report (Forest Service 2022i).
**Issue:** The SGP may affect water resources through acid rock drainage and/or metals leaching from mineralized rock in the mine pits, development rock, and the TSF.

**Indicators:**

- Volume and disposition of mineralized waste generated.
- Lithologic composition of final pit walls and exposure of potentially acid-generating material.
- Removal of legacy mine tailings and waste rock.
- Predicted and observed leachate chemistry of development rock and tailings.

**Issue:** The SGP may cause changes in surface water and groundwater quality.

**Indicators:**

- Surface water quality parameters (e.g., pH, temperature, major ions, TDS, metals, sediment content, and organic carbon).
- Groundwater quality parameters (e.g., pH, major ions, TDS, and dissolved metals).

**Issue:** The SGP may cause increased mercury methylation in adjacent waterbodies through SGP-related activities and discharges.

**Indicator:**

- Predicted impact on methylmercury production.

Surface water and groundwater quality were primarily analyzed using baseline water quality data, geochemical characteristics of development rock and tailings produced by mining, water quality predictions from modeling studies completed by Perpetua and their consultants for the SGP, and the SGP Water Management Plan (Brown and Caldwell 2021b). Other sources consulted include scientific literature and governmental agency documents that identify impaired stream segments and applicable water quality standards.

Several models were developed by Perpetua to support the water quality analysis, including a site-wide water balance model (SWWB), a hydrologic model, a site-wide water chemistry (SWWC) model, and the Stream and Pit Lake Network Temperature (SPLNT) model. Summaries of the SWWB model, SWWC model, and the SPLNT model are provided below. The hydrologic modeling is summarized in the companion SGP Water Quantity Specialist Report (Forest Service 2022e) and additional modeling details can be located in the modeling reports provided by Perpetua (Brown and Caldwell 2021a, 2021e, 2021i, SRK 2021a).

### 4.9.1.1 Geochemical Characterization of Mined Materials

The leachate chemistry of the mine waste material was characterized through static and kinetic test work (SRK 2017, 2020). The kinetic tests were used to define potential acid generating (PAG) and non-PAG development rock source terms for geochemical modeling (SRK 2018a). The summary description of this characterization is found in [Section 3.9.4.2](#).
The HCT program was conducted in two different phases with the first phase focused on anticipated project mined materials and the second phase supplementing mined material samples as well as testing of synthesized and legacy tailings samples. Steady-state constituent release rates from the HCTs were used to develop leachate source terms for each development rock and wall rock lithology. The source terms were assigned by correlating each rock type to a representative HCT based on the lithology, location, and geochemistry of the HCT sample. The test cell HC-14 from the Phase I testing program was selected to represent PAG development rock and wall rock because this cell had the highest total sulfur and highest sulfate leaching rate, which corresponds to maximum sulfide oxidation and acid rock drainage potential. The source terms were then scaled to field conditions to account for differences in reaction rates, temperatures, and liquid-to-solid ratios between laboratory tests and field conditions. For a more detailed discussion of source term development and the site-specific scaling factors used, the reader is referred to SRK 2018a and SRK 2021a. The development rock and wall rock source terms were used as inputs in a geochemical model to predict operational, closure, and post-closure groundwater and surface water quality resulting from the mine pits and/or development rock as activities change over time. Specific water quality predictions are discussed in subsequent sections.

### 4.9.1.2 Water Balance Model

A site-wide water balance model was performed by Brown & Caldwell to assess:

- meteoric precipitation contributions (i.e., rainfall and snowmelt) to surface water and groundwater,
- volumes of water requiring storage and management due to contact with mine facilities (i.e., contact water),
- consumptive use needs and water sourcing for mining and ore processing,
- volume of water requiring water treatment during operations and post-closure following the installation of geosynthetic covers over reclaimed mine facilities, and
- runoff, infiltration, and seepage of meteoric waters incident on stockpiles, the TSF Buttress, and other mined materials.

The modeling was conducted using the commercial GoldSIM software which is widely used in the mining industry for site and facility water balances.

### 4.9.1.3 Hydrologic Model

The effects of mine dewatering and production of water for consumptive use were simulated using a groundwater numerical MODFLOW model (Brown and Caldwell 2021e). This modeling effort is described in Section 4.8.2.2 and the companion SGP Water Quantity Specialist Report (Forest Service 2022e).

With regard to water quality, the hydrologic model provides predictions to assess:

- groundwater inflows to open pits during operations and pit backfill during closure,
- groundwater discharge volume to surface waters, and
- groundwater flow paths from materials in the TSF Buttress, the West End pit Lake and pit backfills that eventually emerge as a surface water flow.
4.9.1.4 **Groundwater Chemistry Model**

Geochemical modeling was performed by SRK to assess future water quality resulting from the SGP (SRK 2021a). The objective of the modeling was to determine the potential for groundwater (and surface water impacts) from the proposed open pits, the TSF, the TSF Buttress, ore stockpiles, and pit backfill material. The adopted methodology included development of conceptual models for operational and post-closure phases of the SGP, and numerical geochemical modeling. The numerical modeling was completed for: (1) Yellow Pine pit and backfill, (2) Hangar Flats pit and backfill, (3) West End pit lake, (4) Midnight pit and backfill, and (5) the TSF and TSF embankment. These models assumed leakage rates for proposed liners to account for small volumes of infiltration through tailings and development rock and their effects on water chemistry.

The general modeling approach was to quantify the solute concentrations in water that would potentially seep from the base of those facilities during operations and post closure, and to predict the likely solute concentrations in the underlying groundwater.

Data used as input to the geochemical models included:

- Geological and mine planning information, including development rock production schedule and mine design;
- Hydrogeologic and hydrologic water balance information;
- Geochemical data from laboratory static and kinetic tests performed on representative materials, scaled to field conditions; and
- Precipitation chemistry data from long-term monitoring at the Smiths Ferry meteorological station, Idaho.

4.9.1.5 **Surface Water Chemistry Model**

The data sources and groundwater chemistry plus pit lake water chemistry forecasts were combined with surface water chemistry data from the Surface Water Quality Baseline Study (HDR 2017f) to predict future surface water chemistry associated with project activities.

The surface water assessment nodes were established at or near surface water sampling locations monitored during the Surface Water Quality Baseline Study (HDR 2017f). The main sources contributing to flow and constituent loading at each of the assessment nodes were identified from the baseline study, the Water Resources Summary Report (Brown and Caldwell 2017a), and from an inventory of legacy mining features provided by Perpetua (SRK 2018b). These sources include upgradient stream flow, flow from seeps and adits in the watershed, loading from legacy mine features, plus any potential sources of groundwater inflow identified from the gain-loss analysis conducted as part of the Water Resources Summary Report (Brown and Caldwell 2017a).

Predictive water quality modeling utilizes the USGS’s PHREEQC software (Parkhurst and Appelo 1999) to forecast water chemistry associated with

- infiltration and seepage from the TSF Buttress,
- the influence of the TSF on groundwater chemistry,
• inundated backfill in the Yellow Pine pit, Hangar Flats pit, and Midnight pit,
• the West End pit lake, and
• water treatment influent and effluent.

Results from the facility water chemistry models describing the source terms were then incorporated into the calibrated SWWC model to assess surface water chemistry at a series of prediction nodes downstream of the facilities (in Meadow Creek, West End Creek, Sugar Creek, and the East Fork SFSR) under high flow and low flow conditions, during both the mine operational and post-closure periods. Examples of loading sources that affect concentrations during the mine operational period include upstream surface water flows, seep flows, and groundwater discharge. During the post closure period, additional mass loading from the TSF, the TSF Buttress, pit lakes, and pit backfills were incorporated into the SWWC model. Ammonia concentrations in surface waters were not explicitly modeled. Of the 109 baseline sample analyses where ammonia was detected above a 0.05 mg/L analytical detection limit, the maximum detected concentrations was 0.57 mg/L, a concentration below the strictest potentially applicable water chemistry standard of 2.1 mg/L.

4.9.1.6 Surface Water Temperature Model

The SPLNT water temperature model was developed by Brown and Caldwell (2019c, 2021f) using two separate software packages: QUAL2K for stream temperature modeling, and the General Lake Model for simulating pit lake temperatures. After the existing conditions SPLNT model had been appropriately calibrated, it was used to generate future temperature predictions for the 2021 MMP in Meadow Creek, West End Creek, Sugar Creek, and the East Fork SFSR. A post closure timeline also was simulated to represent how the site would function after the mine facilities and permitted discharges have been removed, dewatering and mining have been discontinued, and the channels and vegetation have been fully reclaimed.

The SPLNT model results were integrated with other modeling efforts for the SGP. Outputs from the hydrologic model and the site-wide water balance model became SPLNT inputs to simulate streams and pit lakes. Output from the General Lake Model component of the SPLNT model supported development of the SWWC model by providing temperature and dissolved oxygen profiles for the pit lakes.

4.9.2 Direct and Indirect Effects

4.9.2.1 No Action Alternative

Under the No Action Alternative, the Forest Service would not approve the SGP, and therefore no activities proposed on Forest Service lands would be approved as part of the EIS.

This alternative would not include any surface (open-pit) mining or ore processing to extract gold, silver, and antimony, and no underground exploration or related operations included in the proposed 2021 MMP on Forest Service lands would occur. Perpetua would continue to implement surface exploration and associated activities that have been previously approved on Forest Service lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015c). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites.
(total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both Forest Service
and private lands at and in the vicinity of the SGP. The continuation of approved exploration activities at
the SGP by Perpetua would result in the continued use of the existing man camp, office trailers, truck
maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar,
and airstrip (located primarily on patented land), which would require the continued use of diesel,
gasoline, and jet fuel (approximately 141,000 gallons per calendar year) that is stored in aboveground
tanks.

Perpetua would be required to continue to comply with reclamation and monitoring commitments
included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which
include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using
standard reclamation practices, and monitoring to ensure that sediment and stormwater BMPs are in place
and effective so that soil erosion and other potential resource impacts are avoided or minimized.
Additionally, Perpetua could, pursuant to development of another plan of operations, continue
information collecting activities at the SGP and vicinity such as groundwater and surface water
monitoring and reporting beyond which is required as part of the Golden Meadows Exploration EA, care
and maintenance of stormwater BMPs at over 140 historical mining impact locations, and monitoring
stream flow measurements from stream gages installed within creeks.

The legacy mining wastes at the SGP site have contributed to elevated metals concentrations in surface
water. These effects are described in Section 3.9.4.3. Overall, the elevated metals concentrations found in
surface water would only improve with additional source removal. This removal is part of the planned
Phase I scope for the ASAOC signed in 2021 with implementation anticipated in 2022 and 2024. As such,
the effects of the ASAOC are reasonably foreseeable future improvements in analyte concentrations in
Meadow Creek and the EFSRSR associated with stream flow interaction with the historical mine waste.
To the extent that surface waters recharge groundwater in these areas, there would also be a potential
improvement in groundwater analyte concentrations.

Soil sampling and analysis indicate that legacy mining wastes have influenced concentrations of arsenic,
antimony, and mercury in soil within the SGP. The elevated soil concentrations and continued presence of
the waste material provide a pathway for these constituents to leach into groundwater. These effects are
described in Section 3.9.4.3. The elevated antimony and arsenic concentrations in groundwater are
unlikely to improve in the future under the No Action Alternative.

Under the No Action Alternative, there would be no new or upgraded access roads per the 2021 MMP.
Current access to the area, via Johnson Creek Road and Stibnite Road, would continue to be used and
would be expected to have traffic levels similar to current conditions. There would be no change to the
existing condition of surface water quality related to roads.

Under the No Action Alternative, there would be no changes to the existing transmission lines and no
new segment of transmission line constructed. No new communication towers would be established. As
such, there would be no change to the existing condition of surface water quality related to utilities.
The 2021 MMP offsite facilities would not be constructed under this alternative. Existing facilities would likely continue to be used in a similar manner. As such, there would be no change to the existing condition of surface water quality related to off-site facilities.

4.9.2.2 2021 MMP

Water Chemistry Conceptualization

The conceptual development and modeling details associated with the quantitative forecast of water chemistry associated with the 2021 MMP are described in the Site-Wide Water Chemistry Modeling Report (SWWC, SRK 2021a). This section summarized that description as context for the ensuing effects analysis.

In summary, many water chemistry effects of the SGP originate with the mobilization of solutes from mined materials that would otherwise remain stable and in place in their native rock under the No Action scenario. Solutes generated from mined materials are expected to be partially to substantively controlled by water management practices that are part of the SGP.

Mined materials under the 2021 MMP appear in the following mine facilities:

- as mined ore in stockpiles,
- as finely ground tailings in the TSF,
- as mined development rock in the TSF Embankment and Buttress,
- as in situ rock exposed in pit walls of the Yellow Pine, Hangar Flats, and West End open pits, and
- as mined development rock placed as backfill in the Yellow Pine, Hangar Flats and Midnight open pits.

The net effect of the solute mobilization and control measures is reflected in water chemistry associated with specific mine facilities, namely:

- seepage emerging at the ground surface from mine facilities (stockpiles, TSF, TSF Embankment, TSF Buttress),
- seepage infiltrating into the local alluvium from mine facilities (stockpiles, TSF, TSF Embankment, TSF Buttress),
- pit lake water (West End pit lake),
- interstitial water within the backfill material placed in proposed open pits (Yellow Pine pit, Hangar Flats pit, Midnight pit),
- groundwater affected by contact with mine-related solute mobilization, and
- surface water affected by contact with mine-related solute mobilization.

In addition to solute mobilization, the temperatures of surface waters would be affected by the proposed project as it modifies the flow and shading characteristics of the mine area which affect stream temperatures.

Water management practices proposed in the 2021 MMP are incorporated into their associated individual source conceptualizations described below.
**Water Management and Water Treatment**

According to the 2021 MMP (Perpetua 2021a) three water types would require management over the life of the Project: contact water from mine facilities, which includes dewatering water (construction through closure); consolidation water from the TSF (construction through closure which includes process water); and sanitary wastewater (construction through early closure). Figure 4.9-1 is flow diagram showing the main process water components.

Specific sources of mining impacted water that could be expected to require treatment during operations include:

- Contact water from the dewatering of the Hangar Flats, Yellow Pine, and West End pits.
- Contact stormwater runoff from the pits, TSF buttress, Bradley Tailings, SODA, Hecla Heap, ore stockpiles, truck shop, and ore processing facility.
- Toe seepage and pop-out seepage from the TSF buttress and ore stockpiles.
- Sanitary wastewater from the worker housing facility, truck shop, ore processing facility, administrative buildings, and offsite facilities.

After mine closure and final reclamation of the TSF Buttress and pit backfill surfaces which incorporate geosynthetic liners to inhibit interaction between water resources and mined materials, contact water treatment would no longer be required; but process water treatment for the TSF would continue longer, through approximately year 40 to account primarily for consolidation water from the TSF which would exhibit a diminishing flow rate over that period.

**Contact Water Pond Chemistry**

During operations, contact water from SGP facilities, and occasionally pit dewatering water, would be directed to site contact water collection ponds and subsequently directed to the water treatment plant (WTP). Inflow sources to each collection pond, and predicted analytes of concern, are provided in Table 4.9-1. Open pit dewatering water that is not directed to site contact water collection ponds would be pumped directly to the WTP.

The WTP influent water quality was predicted based on water chemistries associated with each of the inflow sources listed in Table 4.9-1, mixed in their relative proportions based on the site wide water balance model, to estimate the mixed influent chemistry to the water treatment plant on a monthly timestep (SRK 2021a, Appendix D). Predicted water chemistries for individual water sources reporting to the contact water ponds are described below.
Project Area

Figure 4.9-1
Project Water Management Components
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
Table 4.9-1  Contact Water Collection Pond Inflow Sources included in Model

<table>
<thead>
<tr>
<th>Contact Water Pond</th>
<th>Inflow Sources</th>
<th>Predicted Analytes with Concentrations above the Strictest Potentially Applied Standards</th>
</tr>
</thead>
</table>
| Hangar Flats Pond  | • Hangar Flats pit contact water  
                   • TSF Buttress toe seepage and runoff  
                   • Bradley Tailings contact water | Antimony, Arsenic, Cadmium, Copper, Fluoride, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Sulfate, Thallium, and Zinc |
| SODA Pond          | • Hangar Flats pit contact water  
                   • TSF Buttress toe seepage and runoff  
                   • Bradley Tailings contact water | Antimony, Arsenic, Cadmium, Copper, Fluoride, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Sulfate, Thallium, and Zinc |
| Plant Ponds        | • Pit Dewatering  
                   • Stockpiles | Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Selenium, and Zinc |
| West End Pond      | • West End pit contact water  
                   • West End In-Pit backfill and stockpile Seepage and runoff | Antimony, Arsenic, Cadmium, Chloride, Copper, Fluoride, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Sulfate, and Zinc |
| Midnight Pond      | • West End pond  
                   • Yellow Pine pit contact water | Antimony, Arsenic, Copper, Mercury, and Lead |

Source: SRK 2021a, Appendices D1-D5

Dewatering Water Chemistry

Forecasts for the water chemistries of the dewatering production for the Yellow Pine, Hangar Flats, and West End pits were developed based on the water in alluvial and bedrock monitoring wells in proximity to those locations. The relative dewatering components from the alluvium and bedrock groundwater were based on the groundwater flow model dewatering simulations (Brown and Caldwell 2021e).

An aggregate dewatering chemistry was calculated from the individual source terms on an annual basis (SRK 2021a, Appendix D6). Predicted dewatering chemistry has consistently circumneutral pH with antimony and arsenic concentrations above the strictest potentially applied water quality standards. In some instances, maximum monthly predicted concentrations of manganese (Mine Years 3, 4, and 5) and mercury (Mine Year 3) were also above the strictest potentially applied water quality standards.

In early years, average predicted arsenic concentrations were between 0.12 mg/L and 0.14 mg/L before decreasing to 0.012 mg/L in Mine Year 6. In the mid-years, dewatering is encountering unimpacted groundwater in the Hangar Flats pit area. Later year predicted arsenic concentrations returned to their initial levels after Mine Year 8. Predicted antimony concentrations exhibited a similar trend with early time dewatering concentrations between 0.014 mg/L and 0.016 mg/L. In Mine Years 4 through 6, average antimony concentrations decreased below the 0.006 mg/L standard before returning to their initial concentrations after Mine Year 8.
Ore Stockpiles

Stockpiles would be used to manage mined ore awaiting processing during project operations. There would be three short-term ore stockpiles located in the processing area near the crushing facility plus five long-term ore stockpiles located on the footprints of the TSF Buttress or the Hangar Flats pit backfill. Stormwater runoff and seepage from the ore stockpiles would be collected in runoff channels and managed as contact water.

Stockpile runoff, toe seepage, and sub-surface infiltration was evaluated by the Site-Wide Water Balance Model (Brown and Caldwell 2021a). The model utilized the volume of meteoric water incident on each stockpile to develop estimates for surface runoff, toe seepage, and sub-surface infiltration over time. Details of this modeling are provided in Brown and Caldwell 2021a and SRK 2021b.

Contributions of analytes leached from stockpiles to water chemistry were estimated based on a weighted-average of humidity cell test results for the lithologies expected to be present in each stockpile. The weights utilized for the calculation were based on the relative percentage of each lithologic unit. Details of the calculations are available in SRK 2021a, Appendix A.

Predicted water chemistries for the stockpiles exhibited circum-neutral pH values with antimony concentrations (0.008 mg/L to 0.016 mg/L) and arsenic concentrations (0.069 mg/L to 0.25 mg/L), both above the strictest potentially applied water quality standards. Other metal leaching concentrations were predicted to be below surface water standards with mercury concentrations between 7 ng/L and 11 ng/L (SRK 2021a, Appendix A), but above the 2 ng/L concentration calculated by the EPA.

TSF Embankment and Buttress

During the construction and early operations phases, Hangar Flats Pond would be located near the northeast toe of the TSF Buttress to provide contact water storage. Runoff and toe seepage from the TSF Buttress and remaining legacy materials in SODA would be conveyed to the Hangar Flats Pond using a series of runoff collection channels or berms, internal collections sumps, pumps, and pipelines as needed. The SODA Pond would be constructed south of the TSF Buttress to provide contact water storage for the remaining years of operations and closure, as the Hangar Flats Pond would be deconstructed as the Hangar Flats pit is mined below the valley bottom.

Operational and post-closure water quality predictions were developed for the TSF Buttress and adjacent TSF Embankment. The general modeling approach was to quantify:

- Solute concentrations in contact waters that would run off the surface of the facility or emerge from the base and intermediate lifts of the facility, either as toe seepage, pop-out seepage or as recharge to groundwater.
- Solute concentrations in groundwater underlying the facility.
Conceptual models for the TSF Buttress and Embankment during operations and closure are shown in Figure 4.9-2. Further details regarding the TSF Buttress design and modeling can be found in Perpetua 2021a and SRK 2021a, respectively. A summary of the information follows.

At final buildout, the TSF Buttress and adjacent TSF Embankment would contain 142 million tons of material, comprising 85.5 million tons (60%) of non-PAG development rock from the Yellow Pine pit, 22 million tons (16%) of non-PAG development rock from the West End pit, 14.3 million tons (10%) of non-PAG development rock from the Hangar Flats pit, 6.4 million tons (4%) of PAG development rock, 11.7 million tons (8%) of borrow material, 1.25 million tons (0.9%) of spent ore from the Hecla Heap, 0.85 million tons (0.6%) of spent ore from the SODA, and 0.2 million tons (0.1%) mine waste placed on the former SMI on/off leach pads during the ASAOC action. Active ‘blending’ of the development rock during operations is not proposed. During operations, ore stockpiles 1, 2, 3 and 4 would be located on top of the TSF Buttress and are assumed to contribute to solute loading from the facility during the operational period only. These stockpiles are assumed to have been completely removed and processed prior to closure.

Representative leachate chemistries for the lithologies within the TSF Buttress and Embankment were obtained from humidity cell effluent data, scaled to field conditions. The details for the leachate chemistry calculation are described in SRK 2021a.

The primary source of contact water for material within the TSF Buttress and Embankment would be rainwater and snowmelt. Any precipitation that falls on the TSF Buttress and Embankment would either run off or infiltrate the facility. Runoff waters are assumed to contact the outermost 0.3 meters (1 foot) of material within the facility. Any precipitation that infiltrates the facility would either recharge groundwater or report as toe seepage or pop-out seepage on the face of the facility (Brown and Caldwell 2021a, 2021c).

Precipitation that infiltrates the facility has the potential to recharge to groundwater. This water was assumed to interact with groundwater in the uppermost 32.8 feet (10 meters) of the aquifer beneath the footprint of the facility (SRK 2021a). The aquifer below the facility consists entirely of alluvium. Any infiltration recharging to groundwater would migrate directly to the water table and no allowance for solute attenuation has been accounted for along the flow path. The residence time in the aquifer of any precipitation that infiltrates the TSF Buttress and Embankment and recharges groundwater, was assumed to be short and on the order of one month to a few months at most (SRK 2021a). The direction of groundwater flow beneath the TSF buttress and Embankment is toward the Hangar Flats pit area.

At closure, the TSF Embankment and Buttress would be regraded to promote positive drainage and a low permeability geosynthetic cover would be placed over the entire facility, which would be designed to limit infiltration through the underlying development rock (Perpetua 2021a). The geosynthetic cover would be overlain by an inert soil/rock layer and growth media and revegetated. Following cover placement, any toe/pop-out seepage from the facility would occur under the liner and is assumed to recharge groundwater.
Under this design and conceptualization, the predicted seepage volume from the TSF Buttress increases during the operations phase until closure of the facility and installation of the geosynthetic liner (Figure 4.9-3). Following closure there is no longer any runoff or toe seepage from contact with the buttress materials. In the post-closure period, residual solution from the buttress materials continues to infiltration into the sub-surface and alluvial groundwater.

Predicted water chemistry associated with runoff from the TSF Buttress and Embankment has circum-neutral pH with concentrations of antimony, arsenic, copper, manganese, mercury, and thallium above the strictest potentially applied water quality standards (Table 4.9-2).

Predicted water chemistry associated with toe seepage from the TSF Buttress and Embankment has circum-neutral pH with concentrations of antimony, arsenic, cadmium, chromium, copper, fluoride, manganese, mercury, nickel, lead, selenium, silver, sulfate, thallium, zinc, and TDS above the strictest potentially applied water quality standards (Table 4.9-3).

Both the runoff and the toe seepage from the TSF Embankment and Buttress report to a contact water pond and then to the water treatment plant. Sub-surface infiltration from the TSF Embankment and Buttress was modeled to mix with the alluvial groundwater under the facility footprint, resulting in a groundwater chemistry that has circum-neutral pH with antimony and arsenic concentrations above the strictest potentially applied water quality standards (Table 4.9-4 and Figure 4.9-4). After the end of operations, predicted groundwater analyte concentrations decrease slightly as TSF Embankment and Buttress seepage is collected on surface. Upon placement of the geosynthetic cover, seepage to the ground surface is inhibited and residual water within the TSF Embankment and Buttress infiltrates, contributing to slightly higher groundwater concentrations. Other constituent concentrations are below standards for groundwater. However, because the alluvial groundwater in the system contributes discharge to surface water flows, it is worth noting that predicted long-term mercury (10 ng/L) and copper concentrations (0.002 mg/L) are increased relative to existing conditions but remain below the most stringent potentially applicable criteria.
Figure 4.9-2
Conceptual Model for Tailings Storage Facility Buttress

Stibnite Gold Project
Stibnite, ID

Data Sources: (SRK 2021)
Figure 4.9-3
Tailings Storage Facility
Buttress Seepage Volume
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
Table 4.9-2  Predicted Runoff Chemistry for the TSF Buttress and Embankment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Strictest Potentially Applicable Surface Water</th>
<th>Operations Mine Year -2 to 12</th>
<th>Post-Mining Prior to Cover Placement Mine Year 13 to 18*</th>
<th>Post-Mining after Cover Placement Mine Year 19 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>s.u.</td>
<td>6.5 - 9</td>
<td>7.45</td>
<td>Minimum 6.94 Maximum 7.96 Average 7.65</td>
<td>No contact water runoff from TSF Buttress and Embankment post-mining</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>mg/L as CaCO₃</td>
<td>&gt;20</td>
<td>13.2</td>
<td>Minimum 3.04 Maximum 32.7 Average 15.7</td>
<td></td>
</tr>
<tr>
<td>Ag</td>
<td>mg/L</td>
<td>0.0007†</td>
<td>0.00002</td>
<td>Minimum 5.9E-06 Maximum 0.0004 Average 0.0002</td>
<td></td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.0027</td>
<td>Minimum 0.0025 Maximum 0.0031 Average 0.0025</td>
<td></td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.14</td>
<td>Minimum 0.029 Maximum 0.34 Average 0.14</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>-</td>
<td>0.048</td>
<td>Minimum 0.0075 Maximum 0.12 Average 0.0557</td>
<td></td>
</tr>
<tr>
<td>Ba</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.021</td>
<td>Minimum 0.0032 Maximum 0.053 Average 0.0251</td>
<td></td>
</tr>
<tr>
<td>Be</td>
<td>mg/L</td>
<td>-</td>
<td>&lt;0.001</td>
<td>Minimum &lt;0.001 Maximum &lt;0.001 Average &lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Ca</td>
<td>mg/L</td>
<td>-</td>
<td>4.92</td>
<td>Minimum 1.22 Maximum 11.6 Average 5.55</td>
<td></td>
</tr>
<tr>
<td>Cd</td>
<td>mg/L</td>
<td>0.00033†</td>
<td>0.00002</td>
<td>Minimum 4.7E-06 Maximum 0.00005 Average 0.00003</td>
<td></td>
</tr>
<tr>
<td>Cl</td>
<td>mg/L</td>
<td>230</td>
<td>0.69</td>
<td>Minimum 0.20 Maximum 1.59 Average 0.83</td>
<td></td>
</tr>
<tr>
<td>Co</td>
<td>mg/L</td>
<td>-</td>
<td>0.0002</td>
<td>Minimum 0.00046 Maximum 0.00048 Average 0.00023</td>
<td></td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.0106†††</td>
<td>0.00057</td>
<td>Minimum 0.00009 Maximum 0.0013 Average 0.00043</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>0.002††</td>
<td>0.0017</td>
<td>Minimum 0.0009 Maximum 0.0041 Average 0.0019</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.069</td>
<td>Minimum 0.0085 Maximum 0.18 Average 0.087</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.3</td>
<td>&lt;0.005</td>
<td>Minimum &lt;0.005 Maximum &lt;0.005 Average &lt;0.005</td>
<td></td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.000012</td>
<td>0.000013</td>
<td>Minimum 1.6E-06 Maximum 0.000032 Average 0.000015</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>mg/L</td>
<td>-</td>
<td>0.94</td>
<td>Minimum 0.26 Maximum 2.18 Average 1.05</td>
<td></td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>-</td>
<td>1.78</td>
<td>Minimum 0.60 Maximum 4.09 Average 2.08</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.017</td>
<td>Minimum 0.0033 Maximum 0.039 Average 0.018</td>
<td></td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
<td>-</td>
<td>0.0031</td>
<td>Minimum 0.0025 Maximum 0.0081 Average 0.0033</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>-</td>
<td>1.86</td>
<td>Minimum 0.33 Maximum 4.79 Average 2.36</td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>0.024††</td>
<td>0.0015</td>
<td>Minimum 0.0025 Maximum 0.0035 Average 0.0013</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Units</td>
<td>Strictest Potentially Applicable Surface Water Quality Criteria*</td>
<td>Operations Mine Year -2 to 12</td>
<td>Post-Mining Prior to Cover Placement Mine Year 13 to 18*</td>
<td>Post-Mining after Cover Placement Mine Year 19 to 112</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>---------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>-</td>
<td>0.024</td>
<td>0.0075</td>
<td>0.055</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>0.0009†</td>
<td>0.00041</td>
<td>0.00009</td>
<td>0.00098</td>
</tr>
<tr>
<td>Sb</td>
<td>mg/L</td>
<td>0.0052</td>
<td>0.065</td>
<td>0.018</td>
<td>0.15</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>0.0031</td>
<td>0.00007</td>
<td>0.00002</td>
<td>0.00014</td>
</tr>
<tr>
<td>SO4</td>
<td>mg/L</td>
<td>250</td>
<td>7.34</td>
<td>1.77</td>
<td>17.3</td>
</tr>
<tr>
<td>TI</td>
<td>mg/L</td>
<td>0.000017</td>
<td>2.5E-06</td>
<td>5.4E-07</td>
<td>5.6E-06</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>0.054†</td>
<td>0.0051</td>
<td>0.00087</td>
<td>0.013</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>31.8</td>
<td>7.89</td>
<td>80.0</td>
</tr>
<tr>
<td>NO3 + NO2</td>
<td>mg/L as N</td>
<td></td>
<td>8.43</td>
<td>1.64</td>
<td>17.8</td>
</tr>
</tbody>
</table>

Source: SRK 2021a
All values are for the dissolved fraction unless otherwise noted
< Indicates parameter was consistently below analytical detection limits in the HCT effluents, and is thus not expected at detectable concentrations in the buttress toe/pop-out seepage waters
- Indicates no guideline for parameter
†Indicates hardness-dependent parameter. The values listed are based on the East Fork SFSR hardness of 40 mg/L as calcium carbonate, which represents the 5th percentile hardness during the driest four months at node YP-SR-10 (East Fork SFSR below Meadow Creek) between April 2012 and May 2019.
†† Estimated criterion based on DEQ guidance on Biotic Ligand Model and limited site-specific SGP data
†††† Standard is for chromium VI and is based on Water Effect Ratio
* During this period, runoff would only be generated in Mine Year 16 according to the SWWB (Brown and Caldwell 2021a). Therefore, only a single prediction (rather than a range) is provided for each parameter
Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria
Table 4.9-3  Predicted Toe/Pop-out Seepage Chemistry for the TSF Buttress and Embankment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Strictest Potentially Applicable Surface Water Quality Criteria*</th>
<th>Operations Mine Year -2 to 12</th>
<th>Post-Mining Prior to Cover Placement Mine Year 13 to 18</th>
<th>Post-Mining after Cover Placement Mine Year 19 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stricter Potentially Applicable</td>
<td>Operations Mine Year -2 to 12</td>
<td>Post-Mining Prior to Cover Placement Mine Year 13 to 18</td>
<td>Post-Mining after Cover Placement Mine Year 19 to 112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Water Quality Criteria*</td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>pH</td>
<td>s.u.</td>
<td>6.5 - 9</td>
<td>8.39</td>
<td>8.35</td>
<td>8.61</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>mg/L as CaCO₃</td>
<td>&gt;20</td>
<td>107</td>
<td>92.2</td>
<td>192</td>
</tr>
<tr>
<td>Ag</td>
<td>mg/L</td>
<td>0.0007†</td>
<td>0.00098</td>
<td>0.00071</td>
<td>0.0037</td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.0044</td>
<td>0.0041</td>
<td>0.0059</td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>0.01</td>
<td>6.23</td>
<td>3.37</td>
<td>22.4</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>-</td>
<td>1.71</td>
<td>0.83</td>
<td>3.64</td>
</tr>
<tr>
<td>Ba</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.0081</td>
<td>0.0067</td>
<td>0.011</td>
</tr>
<tr>
<td>Be</td>
<td>mg/L</td>
<td>-</td>
<td>0.0010</td>
<td>0.0010</td>
<td>0.0010</td>
</tr>
<tr>
<td>Ca</td>
<td>mg/L</td>
<td>-</td>
<td>26.8</td>
<td>10.2</td>
<td>29.9</td>
</tr>
<tr>
<td>Cd</td>
<td>mg/L</td>
<td>0.00033†</td>
<td>0.00092</td>
<td>0.00054</td>
<td>0.0024</td>
</tr>
<tr>
<td>Cl</td>
<td>mg/L</td>
<td>230</td>
<td>21.1</td>
<td>11.2</td>
<td>30.1</td>
</tr>
<tr>
<td>Co</td>
<td>mg/L</td>
<td>-</td>
<td>0.0072</td>
<td>0.0047</td>
<td>0.010</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.0106††</td>
<td>0.017</td>
<td>0.0050</td>
<td>0.024</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>0.002††</td>
<td>0.004</td>
<td>0.004</td>
<td>0.004</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>2.0</td>
<td>2.27</td>
<td>0.97</td>
<td>3.60</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.3</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.000012</td>
<td>0.00041</td>
<td>&lt;0.0000006</td>
<td>0.00055</td>
</tr>
<tr>
<td>K</td>
<td>mg/L</td>
<td>-</td>
<td>36.4</td>
<td>24.6</td>
<td>76.3</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>-</td>
<td>57.2</td>
<td>39.5</td>
<td>91.3</td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.24</td>
<td>0.094</td>
<td>0.27</td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
<td>-</td>
<td>0.091</td>
<td>0.029</td>
<td>0.14</td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>-</td>
<td>54.3</td>
<td>22.6</td>
<td>75.9</td>
</tr>
</tbody>
</table>

*Post-mining the application of a low permeability geosynthetic cover to the TSF Buttress and Embankment means any toe/pop-out seepage would report to groundwater.*

Note: † indicates a conservative lower bound; †† indicates a conservative upper bound.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Strictest PotentiallyApplicable Surface Water Quality Criteriaa</th>
<th>Operations Mine Year -2 to 12</th>
<th>Post-Mining Prior to Cover Placement Mine Year 13 to 18</th>
<th>Post-Mining after Cover Placement Mine Year 19 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>0.024†</td>
<td>0.047</td>
<td>0.012</td>
<td>0.065</td>
</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>-</td>
<td>1.17</td>
<td>0.89</td>
<td>3.05</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>0.0009†</td>
<td>0.015</td>
<td>0.0091</td>
<td>0.028</td>
</tr>
<tr>
<td>Sb</td>
<td>mg/L</td>
<td>0.0052</td>
<td>2.83</td>
<td>1.89</td>
<td>7.19</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>0.0031</td>
<td>0.0046</td>
<td>0.0026</td>
<td>0.024</td>
</tr>
<tr>
<td>SO₄</td>
<td>mg/L</td>
<td>250</td>
<td>240</td>
<td>143</td>
<td>296</td>
</tr>
<tr>
<td>Tl</td>
<td>mg/L</td>
<td>0.000017</td>
<td>0.00009</td>
<td>0.00005</td>
<td>0.00010</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>0.0100</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>0.054†</td>
<td>0.16</td>
<td>0.082</td>
<td>0.21</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>573</td>
<td>414</td>
<td>943</td>
</tr>
<tr>
<td>NO₃ + NO₂</td>
<td>mg/L as N</td>
<td>-</td>
<td>70.7</td>
<td>20.8</td>
<td>298</td>
</tr>
</tbody>
</table>

Source: SRK 2021a
All values are for the dissolved fraction unless otherwise noted
- Indicates parameter was consistently below analytical detection limits in the HCT effluents, and is thus not expected at detectable concentrations in the buttress toe/pop-out seepage waters
- Indicates no guideline for parameter
† Indicates hardness-dependent parameter. The values listed are based on the East Fork SFSR hardness of 40 mg/L as calcium carbonate, which represents the 5th percentile hardness during the driest four months at node YP-SR-10 (East Fork SFSR below Meadow Creek) between April 2012 and May 2019.
†† Estimated criterion based on DEQ guidance on Biotic Ligand Model and limited site-specific SGP data
††† Standard is for chromium VI and is based on Water Effect Ratio
Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Idaho Groundwater Quality Standard (IDAPA 58.01.11)</th>
<th>Existing alluvial groundwater chemistry under facility (MWH-A01)</th>
<th>Existing bedrock groundwater chemistry under facility (MWH-B02)</th>
<th>Operations Mine Year -2 to 12</th>
<th>Post-Mining Prior to Cover Placement Mine Year 13 to 18</th>
<th>Post-Mining after Cover Placement Mine Year 19 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH</strong></td>
<td>mg/L</td>
<td>6.5 - 8.5*</td>
<td>7.24</td>
<td>6.57</td>
<td>7.63</td>
<td>7.54</td>
<td>7.54</td>
</tr>
<tr>
<td><strong>Total Alkalinity</strong></td>
<td>mg/L as CaCO₃</td>
<td>-</td>
<td>59.5</td>
<td>38.7</td>
<td>55.9</td>
<td>54.1</td>
<td>56.6</td>
</tr>
<tr>
<td><strong>Ag</strong></td>
<td>mg/L</td>
<td>0.1*</td>
<td>9.6E-06</td>
<td>9.4E-06</td>
<td>0.00002</td>
<td>0.000002</td>
<td>0.000007</td>
</tr>
<tr>
<td><strong>Al</strong></td>
<td>mg/L</td>
<td>0.2*</td>
<td>0.0065</td>
<td>0.051</td>
<td>0.0025</td>
<td>0.0025</td>
<td>0.0025</td>
</tr>
<tr>
<td><strong>As</strong></td>
<td>mg/L</td>
<td>0.05</td>
<td>0.0063</td>
<td>0.00040</td>
<td>0.067</td>
<td>0.0087</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>mg/L</td>
<td>-</td>
<td>0.0072</td>
<td>0.0074</td>
<td>0.027</td>
<td>0.0080</td>
<td>0.043</td>
</tr>
<tr>
<td><strong>Ba</strong></td>
<td>mg/L</td>
<td>2</td>
<td>0.0020</td>
<td>0.0028</td>
<td>0.0022</td>
<td>0.0022</td>
<td>0.0022</td>
</tr>
<tr>
<td><strong>Be</strong></td>
<td>mg/L</td>
<td>0.004</td>
<td>9.2E-06</td>
<td>0.00002</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
<tr>
<td><strong>Ca</strong></td>
<td>mg/L</td>
<td>-</td>
<td>17.8</td>
<td>10.2</td>
<td>16.4</td>
<td>15.8</td>
<td>16.6</td>
</tr>
<tr>
<td><strong>Cd</strong></td>
<td>mg/L</td>
<td>0.005</td>
<td>9.6E-06</td>
<td>0.00002</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
<tr>
<td><strong>Cl</strong></td>
<td>mg/L</td>
<td>250*</td>
<td>0.30</td>
<td>0.27</td>
<td>0.55</td>
<td>0.30</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Co</strong></td>
<td>mg/L</td>
<td>-</td>
<td>0.00010</td>
<td>0.00026</td>
<td>0.00022</td>
<td>0.00015</td>
<td>0.00028</td>
</tr>
<tr>
<td><strong>Cr</strong></td>
<td>mg/L</td>
<td>0.1</td>
<td>0.00029</td>
<td>0.00020</td>
<td>0.00051</td>
<td>0.00027</td>
<td>0.00069</td>
</tr>
<tr>
<td><strong>Cu</strong></td>
<td>mg/L</td>
<td>1.3</td>
<td>0.00048</td>
<td>0.00038</td>
<td>0.0005</td>
<td>0.0005</td>
<td>0.0005</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>mg/L</td>
<td>4</td>
<td>0.076</td>
<td>0.074</td>
<td>0.11</td>
<td>0.083</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Fe</strong></td>
<td>mg/L</td>
<td>0.3*</td>
<td>0.012</td>
<td>0.055</td>
<td>0.00163</td>
<td>0.00159</td>
<td>0.0018</td>
</tr>
<tr>
<td><strong>Hg</strong></td>
<td>mg/L</td>
<td>0.002</td>
<td>5.5E-07</td>
<td>1.4E-06</td>
<td>6.1E-06</td>
<td>1.0E-06</td>
<td>0.00001</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>mg/L</td>
<td>-</td>
<td>0.77</td>
<td>0.57</td>
<td>1.13</td>
<td>0.83</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Mg</strong></td>
<td>mg/L</td>
<td>-</td>
<td>1.47</td>
<td>1.16</td>
<td>2.08</td>
<td>1.42</td>
<td>2.53</td>
</tr>
<tr>
<td><strong>Mn</strong></td>
<td>mg/L</td>
<td>0.05*</td>
<td>0.00008</td>
<td>0.011</td>
<td>0.0059</td>
<td>0.0035</td>
<td>0.0076</td>
</tr>
<tr>
<td><strong>Mo</strong></td>
<td>mg/L</td>
<td>-</td>
<td>0.0012</td>
<td>0.00029</td>
<td>0.0023</td>
<td>0.0012</td>
<td>0.0035</td>
</tr>
<tr>
<td><strong>Na</strong></td>
<td>mg/L</td>
<td>-</td>
<td>2.66</td>
<td>3.87</td>
<td>3.65</td>
<td>3.12</td>
<td>4.30</td>
</tr>
<tr>
<td><strong>Ni</strong></td>
<td>mg/L</td>
<td>-</td>
<td>0.00019</td>
<td>0.00035</td>
<td>0.00084</td>
<td>0.00023</td>
<td>0.0013</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>mg/L</td>
<td>-</td>
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<td>0.014</td>
<td>0.028</td>
<td>0.017</td>
<td>0.034</td>
</tr>
<tr>
<td><strong>Pb</strong></td>
<td>mg/L</td>
<td>0.015</td>
<td>2.4E-05</td>
<td>5.2E-05</td>
<td>0.00021</td>
<td>3.7E-05</td>
<td>0.00033</td>
</tr>
<tr>
<td><strong>Sb</strong></td>
<td>mg/L</td>
<td>0.006</td>
<td>0.0020</td>
<td>0.0016</td>
<td>0.033</td>
<td>0.002</td>
<td>0.050</td>
</tr>
<tr>
<td><strong>Sc</strong></td>
<td>mg/L</td>
<td>0.05</td>
<td>0.00050</td>
<td>0.00049</td>
<td>0.00053</td>
<td>0.00050</td>
<td>0.00054</td>
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<tr>
<td><strong>SO₄</strong></td>
<td>mg/L</td>
<td>250*</td>
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<td>6.70</td>
<td>3.76</td>
<td>8.81</td>
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<tr>
<td><strong>TI</strong></td>
<td>mg/L</td>
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<td>0.00001</td>
<td>9.3E-06</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
<tr>
<td>Parameter</td>
<td>Units</td>
<td>Idaho Groundwater Quality Standard (IDAPA 58.01.11)</td>
<td>Existing alluvial groundwater chemistry under facility (MWH-A01)</td>
<td>Existing bedrock groundwater chemistry under facility (MWH-B02)</td>
<td>Operations Mine Year -2 to 12</td>
<td>Post-Mining Prior to Cover Placement Mine Year 13 to 18</td>
<td>Post-Mining after Cover Placement Mine Year 19 to 112</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>0.00031</td>
<td>0.00019</td>
<td>0.00028</td>
<td>0.00028</td>
<td>0.00029</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>5*</td>
<td>0.00087</td>
<td>0.0014</td>
<td>0.0031</td>
<td>0.0011</td>
<td>0.0047</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500*</td>
<td>63.1</td>
<td>42.6</td>
<td>65.2</td>
<td>58.3</td>
<td>68.8</td>
</tr>
<tr>
<td>NO₂ + NO₃</td>
<td>mg/L as N</td>
<td>10</td>
<td>0.49</td>
<td>0.62</td>
<td>1.07</td>
<td>0.59</td>
<td>1.56</td>
</tr>
</tbody>
</table>

All values are for the dissolved fraction unless otherwise noted.
- Indicates no guideline for parameter; * Indicates secondary groundwater standard.
Shading indicates value is greater than Idaho Groundwater Quality Standard (IDAPA 58.01.11).
Figure 4.9-4
Predicted Tailings Storage Facility Buttress Seepage Chemistry
Stibnite Gold Project
Stibnite, ID
Data Source: (SRK 2021)
Tailings Storage Facility

Operational and post-closure water quality predictions have been developed for the TSF (SRK 2021a). The general modeling approach was to quantify:

- Solute concentrations in waters that could potentially seep through defects in the liner, both during operations and post-closure.
- Solute concentrations in groundwater underlying the TSF.
- Solute concentrations in consolidation water emerging at the surface of the TSF after operations end.
- Post-closure solute concentrations in commingled surface water runoff from the covered TSF surface. The model assumes this water consists of a mixture of run-on to the TSF, runoff, consolidation water and minor seepage through the TSF cover that may contact the upper surface of the tailings.

The conceptual model for the TSF is presented in Figure 4.9-5, illustrating the TSF water chemistry conditions during operations, closure prior to cover placement, and post-closure following cover placement (SRK 2021a). This conceptual model is based on Perpetua 2021a and is summarized below.

Tailings generated by the Project would be deposited in a fully-lined facility with an engineered rockfill dam and supporting development rock buttress. The composite liner system inhibits tailings water from exiting the facility and mixing with surface water and groundwater. A system of perforated pipes would be installed in the basin before the liner was constructed to collect and drain groundwater out from under the liner. Another drainage system of perforated pipes would be installed on top of the liner before tailings were discharged into the TSF. These upper drains are intended to reduce the hydraulic head of tailings water on top of the liner system.

During operations, the TSF would store tailings solids, water entrained within the tailings, and free water atop the tailings (supernatant pool). Approximately 120 million tons of tailings solids would be stored in the TSF at full buildout, including approximately 115 million tons of ground ore, plus approximately 5 million tons of lime, ground limestone and gypsum resulting from the neutralization of oxidized sulfides. Water collected in or falling on the surface of the TSF would drain to the supernatant pool on top of the tailings and be recycled, along with tailings consolidation water, for use in ore processing. There would be no runoff from the TSF discharged to Meadow Creek during operations, as any precipitation that falls within the TSF would be contained within the facility and managed within the process circuit.

During operations, pore water released from the tailings during consolidation would report to the supernatant pool or to the over-liner drains, and from there be collected and pumped either to the supernatant pool or directly to the reclaim system.
At closure, the TSF facility would be graded and contoured, and a low permeability geosynthetic cover would be placed on top of the tailings. The reclamation would require approximately nine years after ore processing operations cease to allow sufficient tailings consolidation, drainage, and drying to reclaim the facility surface and install the restored Meadow Creek stream channel across the facility (Perpetua 2021a). The application of a low permeability geosynthetic cover would reduce infiltration into the TSF solids by at least 95 percent. Minor infiltration through the cover may contact the upper portion of the underlying tailings, and this contact water would mix with consolidation water.

Consolidation of the tailings would continue after cover placement and surface reclamation, at gradually declining rates, and this consolidation water would be withdrawn from beneath the geosynthetic cover using a combination of wells, wicks, and/or gravel drains (that would convey water to a sump with an extraction well) and routed to water treatment. The rates of consolidation water withdrawal along with cover infiltration and runoff were predicted as part of the Site-Wide Water Balance modeling effort (Brown and Caldwell 2021a) and are depicted in Figure 4.9-6. The predicted time for tailings consolidation and collection of consolidation water is expected to be until year 40.

Despite the best practice design, there could be minor seepage from manufacturing defects and other openings in the basal TSF liner, which would ultimately infiltrate to groundwater. This minor seepage would interact with groundwater in the uppermost 32.8 feet (10 meters) of the alluvial aquifer beneath the footprint of the facility. Groundwater below the facility would flow toward the backfilled Hangar Flats pit.

Details of the tailings water chemistry prediction are included in SRK 2021a and summarized below.

Metallurgical testing provided an opportunity to collect samples representative of tailings solids and water that were used in the assessment of operational and post-closure tailings geochemistry (Table 4.9-5).
Figure 4.9-5
Conceptual Model
Tailings Storage Facility
Stibnite, ID
Data Sources: (SRK 2021)
All water reporting to TSF surface treated or evaporated

TSF cover in place but all water reporting to TSF surface is assumed to be treated

Consolidation water is zero and all water discharged to Meadow Creek

**Note:** Treatment of all water reporting to the TSF following placement of the cover is a simplifying assumption used in the SWWC model. In reality, only the consolidation water will be treated and all other TSF surface water will be routed to Meadow Creek after cover placement.
### Table 4.9-5  Details of Tailings Composite Samples

<table>
<thead>
<tr>
<th>Composite ID</th>
<th>Material</th>
<th>Time Period (Mine Year)</th>
<th>Proportion of Total Tailings$^1$</th>
<th>Proportion of Last 3 Years Production$^1$</th>
<th>HCT Test Duration used in Source Term</th>
<th>Total S (%)$^2$</th>
<th>Sulfide S (%)$^2$</th>
<th>NPR$^2$</th>
<th>As (mg/kg)$^2$</th>
<th>Sb (mg/kg)$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCT-4331 SB100 CON 10 PP HCT</td>
<td>Concurrent Mining of Yellow Pine (85%) and Hangar Flats (15%)</td>
<td>1 - 7</td>
<td>32%</td>
<td>0%</td>
<td>77</td>
<td>1.25</td>
<td>0.060</td>
<td>19</td>
<td>3,150</td>
<td>0.026</td>
</tr>
<tr>
<td>HCT-4331 CON 5 COMBINED TAILS</td>
<td>Late YP Production</td>
<td>4 - 7</td>
<td>21%</td>
<td>18%</td>
<td>77</td>
<td>0.66</td>
<td>0.090</td>
<td>8.9</td>
<td>2,280</td>
<td>0.0027</td>
</tr>
<tr>
<td>HCT-4331 CON 11 COMBINED TAILS</td>
<td>West End Sulfide</td>
<td>11 - 12</td>
<td>11%</td>
<td>12%</td>
<td>77</td>
<td>1.84</td>
<td>0.69</td>
<td>9.9</td>
<td>2,870</td>
<td>0.017</td>
</tr>
<tr>
<td>HCT-4331 CON 12 COMBINED TAILS</td>
<td>Concurrent Mining of West End (50%) and Hangar Flats (50%)</td>
<td>6 - 10</td>
<td>6%</td>
<td>3%</td>
<td>77</td>
<td>1.04</td>
<td>0.11</td>
<td>38</td>
<td>1,580</td>
<td>0.026</td>
</tr>
<tr>
<td>HCT-4331 5197 CN-170/D1 HCT</td>
<td>West End Oxide</td>
<td>-1 - 12</td>
<td>30%</td>
<td>67%</td>
<td>77</td>
<td>0.29</td>
<td>0.090</td>
<td>58</td>
<td>1,040</td>
<td>0.0063</td>
</tr>
</tbody>
</table>

$^1$ AECOM 2020b  
$^2$ SRK 2021a
For the purpose of the TSF geochemical model, it is assumed that pore water within the TSF primarily comprises process water chemistry. Representative process water chemistry data were obtained from HCT tailings decant solution collected as part of the metallurgical test work program (Table 3.9-6).

The predicted post-closure TSF consolidation water chemistry is presented in Table 4.9-6 and is summarized in Figure 4.9-7 for key constituents of concern (arsenic, antimony, mercury, sulfate, pH, and copper). During the early closure period and prior to cover placement (between Mine Years 15 and 23), TSF surface water chemistry would be dominated by tailings consolidation water expelled from the tailings solids. During this period, several constituent concentrations are predicted to be above the strictest potentially applicable water quality standards, including arsenic, antimony, fluoride, mercury, manganese, silver, sulfate, thallium, total cyanide, and WAD cyanide. These waters would be collected and routed to the treatment plant and would not be discharged to Meadow Creek prior to treatment.

When tailings are sufficiently consolidated to allow equipment to access the TSF surface around Mine Year 23, a geosynthetic cover would be placed over the tailings to reduce meteoric water contact with tailings material and infiltration into the TSF. During and following cover placement, tailings would continue to consolidate and produce water. Constituent concentrations in TSF surface waters decrease between Mine Years 15 and 40 as the volume of consolidation water declines (Figure 4.9-7). Through this period (approximately 40 years), TSF surface water would be routed to the water treatment plant before discharge to Meadow Creek.

From Mine Year 41 onwards, it is expected that consolidation would be complete and pore water drainage from the tailings would cease (Brown and Caldwell 2021b). Thereafter, TSF surface waters would then be comprised of a mixture of runon and runoff from the TSF cover, in addition to infiltration through defects in the cover that would contact the uppermost surface of the tailings then mix with other interstitial waters within the cover. During this period, TSF surface waters are predicted to be slightly acidic (pH 5.7 to 5.8) and pH and alkalinity are below the strictest potentially applicable surface water quality standard. This reflects the naturally acidic pH of rainwater rather than the tailings geochemistry. The tailings geochemical characterization test work demonstrates that the tailings material is non-acid generating (SRK 2021a). Annual average concentrations of all other parameters in TSF surface waters are predicted to be below the strictest potentially applicable surface water quality standards from Mine Year 41 onwards.
Figure 4.3-7
Predicted Tailings Storage Facility Seepage Chemistry
Stibnite Gold Project
Stibnite, ID
Data Source: (SNW 2021)
### Table 4.9-6 Predicted TSF Surface Water Chemistry

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Stricest Potentially Applicable Surface Water Quality Criteria</th>
<th>Operations</th>
<th>Post-Mining during Active Treatment and Prior to Cover Placement*</th>
<th>Post-Mining during Active Treatment and After Cover Placement</th>
<th>Post-Mining no Water Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mine Year -2 to 12</td>
<td>Mine Year 15** to 22</td>
<td>Mine Year 23 to 40</td>
<td>Mine Year 41 to 112</td>
</tr>
<tr>
<td>pH</td>
<td>mg/L</td>
<td>6.5 - 9</td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.11</td>
<td>8.07</td>
<td>8.14</td>
<td>5.6**</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>66.9</td>
<td>53.9</td>
<td>70.2</td>
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<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total Alkalinity</td>
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</tr>
<tr>
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</tr>
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<td>0.0003</td>
</tr>
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<td>mg/L</td>
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<td>0.0012</td>
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<td>&lt;0.0008</td>
<td>&lt;0.0008</td>
<td>&lt;0.0008</td>
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<tr>
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<td>0.0012</td>
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</tr>
<tr>
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<tr>
<td>Cd</td>
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<td>0.00002</td>
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<tr>
<td>Co</td>
<td>mg/L</td>
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<td>2.9E-06</td>
<td>7.7E-07</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.0106**</td>
<td>0.00016</td>
<td>0.0006</td>
<td>0.00016</td>
<td>0.0003</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>0.002**</td>
<td>0.00026</td>
<td>0.0008</td>
<td>0.00064</td>
<td>3.9E-06</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
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<td>3.40</td>
<td>1.95</td>
<td>3.98</td>
<td>0.00024</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
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<td>6.8E-09</td>
<td>1.9E-06</td>
<td>1.9E-07</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
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<td>0.00072</td>
<td>0.0053</td>
<td>0.0077</td>
<td>1.1E-06</td>
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<tr>
<td>K</td>
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<td>88.9</td>
<td>39.4</td>
<td>113</td>
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</tr>
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<td>0.22</td>
<td>0.099</td>
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<tr>
<td>Mo</td>
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<td>0.064</td>
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</tr>
<tr>
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<td>mg/L</td>
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<td>1100</td>
<td>3181</td>
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<tr>
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<td>&lt;0.008</td>
<td>&lt;0.008</td>
<td>&lt;0.008</td>
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<tr>
<td>P</td>
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<td>&lt;0.01</td>
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<tr>
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<td>0.96</td>
<td>0.00005</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>0.0031</td>
<td>7.4E-07</td>
<td>7.4E-07</td>
<td>7.4E-07</td>
<td>3.5E-07</td>
</tr>
<tr>
<td>SO4</td>
<td>mg/L</td>
<td>250</td>
<td>5830</td>
<td>2607</td>
<td>7392</td>
<td>0.65</td>
</tr>
<tr>
<td>Tl</td>
<td>mg/L</td>
<td>0.000017</td>
<td>0.0020</td>
<td>0.00086</td>
<td>0.0025</td>
<td>1.2E-07</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>0.054†</td>
<td>6.9E-06</td>
<td>4.3E-06</td>
<td>9.00001</td>
<td>3.1E-06</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>3.4E-06</td>
<td>6.96</td>
<td>1.07</td>
<td>8.85</td>
<td>0.00004</td>
</tr>
<tr>
<td>NO2 + NO3</td>
<td>mg/L</td>
<td>-</td>
<td>8876</td>
<td>4032</td>
<td>11371</td>
<td>1.44</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>1.38</td>
<td>1.18</td>
<td>2.12</td>
<td></td>
</tr>
</tbody>
</table>

All values are for the dissolved fraction unless otherwise noted
* TSF surface water is assumed to report to water treatment in Mine Years 15 (when processing of stockpiled ore ends) through 40
** During Mine Years 13 and 14, open pit mining would have ended, but stockpiled ore would be processed with water reporting to the TSF surface being recycled
*** The pH and alkalinity reflect the naturally acidic rainwater (pH 5.2) rather than the tailings geochemistry which is non-acid-generating
† Parameter was consistently below analytical detection limits in the geochemical testing, and is thus not expected at detectable concentrations in the TSF surface waters
†† Indicates hardness-dependent parameter. Calculated based on 100 mg/L total hardness and water effect ratio of 1
††† Estimated criterion based on DEQ guidance on Biotic Ligand Model and limited site-specific SGP data
Shading indicates value is greater than Stricest Potentially Applicable Surface Water Quality Criteria
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As described above, despite application of best practices, there is a potential for the tailings facility basal liner to develop small-scale leaks through which tailings solution could enter the subsurface and infiltrate to local alluvial groundwater. Leakage estimates have been developed for each year of operations based on the water elevation and maximum head for each year. The calculated liner leakage estimates are provided in Table 4.9-7.

Table 4.9-7  TSF Liner Leakage Estimates (Tierra Group 2020)

<table>
<thead>
<tr>
<th>Mine Year</th>
<th>Tailings Elevation (m)</th>
<th>Area (m²)</th>
<th>Maximum Head on Liner (m)</th>
<th>Liner Leakage (m³/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,063</td>
<td>292,076</td>
<td>42</td>
<td>34.3</td>
</tr>
<tr>
<td>2</td>
<td>2,080</td>
<td>433,328</td>
<td>59</td>
<td>64.8</td>
</tr>
<tr>
<td>3</td>
<td>2,092</td>
<td>532,579</td>
<td>71</td>
<td>96.5</td>
</tr>
<tr>
<td>4</td>
<td>2,102</td>
<td>608,787</td>
<td>82</td>
<td>130</td>
</tr>
<tr>
<td>5</td>
<td>2,110</td>
<td>691,655</td>
<td>89</td>
<td>158</td>
</tr>
<tr>
<td>6</td>
<td>2,116</td>
<td>749,533</td>
<td>96</td>
<td>186</td>
</tr>
<tr>
<td>7</td>
<td>2,122</td>
<td>830,742</td>
<td>101</td>
<td>212</td>
</tr>
<tr>
<td>8</td>
<td>2,127</td>
<td>874,224</td>
<td>106</td>
<td>241</td>
</tr>
<tr>
<td>9</td>
<td>2,132</td>
<td>955,724</td>
<td>111</td>
<td>267</td>
</tr>
<tr>
<td>10</td>
<td>2,136</td>
<td>1,000,833</td>
<td>115</td>
<td>294</td>
</tr>
<tr>
<td>11</td>
<td>2,140</td>
<td>1,105,979</td>
<td>119</td>
<td>320</td>
</tr>
<tr>
<td>12</td>
<td>2,144</td>
<td>1,152,603</td>
<td>123</td>
<td>345</td>
</tr>
<tr>
<td>13</td>
<td>2,147</td>
<td>1,202,752</td>
<td>127</td>
<td>372</td>
</tr>
<tr>
<td>14</td>
<td>2,151</td>
<td>1,255,297</td>
<td>130</td>
<td>402</td>
</tr>
</tbody>
</table>

Source: Tierra Group 2020

Following operations and into closure, liner leakage decreasing from the Mine Year 14 rate down to near zero is assumed to occur until Mine Year 41 when tailing consolidation is expected to be complete and very minor pore water would drain from the tailings.

The predicted groundwater chemistry underlying the TSF after the TSF leakage is mixed with the upper portion of the alluvial aquifer is presented in Table 4.9-8 and time series plots for the key constituents of interest are presented on Figure 4.9-8. This information shows predicted groundwater quality for the operational and post-closure period compared to IDAPA 58.01.11 groundwater quality standards and existing alluvial aquifer groundwater quality in the TSF area (MWH-A01 and MWH-B01).

The results demonstrate that all constituents are predicted to be below IDAPA 58.01.11 groundwater quality standards in groundwater underlying the future TSF. Predicted groundwater quality under the facility is very similar to existing groundwater chemistry for both operational and post-closure conditions. Furthermore, no significant increases in concentration are predicted as a result of the TSF, which relates to the very low expected seepage volumes from the facility (Tierra Group 2020).
Water Treatment

The mine-affected waters described above that report to the ground surface would be subject to consumptive use in ore processing with any water production above consumptive use subject to water treatment and discharge. To summarize, these mine-affected waters include: dewatering production, waters collected in contact water ponds, stockpile runoff and toe seepage, TSF Buttress runoff and toe seepage, and post-closure TSF facility solutions.

Waters infiltrating into the subsurface under the mine facilities would mix with alluvial groundwater and are not subject to water treatment except in instances where alluvial groundwater is subsequently pumped for mine dewatering.

The Site-Wide Water Balance model (Brown and Caldwell 2021a) provides a forecast for the volumes of water that would require water treatment for the operating and post closure time-periods (Figure 4.9-9). A principal driver for predicting water treatment rates would be uncertainty in future precipitation rates and their effect on contact water. A 120-year precipitation record was utilized to develop percentile estimates for meteoric inputs to the water balance (5th through 95th percentile ranges) which are displayed on Figure 4.9-9. Initially, the volumes of water destined for water treatment would be less than 500 gpm because dewatering and seepage rates from newly constructed facilities would be ramping up at the same time that consumptive use demand for processing needs would be at its largest and consuming contact water as a supply. Over time, water treatment volumes would increase through about Mine Year 6 to approximately 2,000 gpm as dewatering production and seepage rates would constitute a higher percentage of diversion for process water in those years, displacing contact water as a source. Differences in actual versus predicted dewatering rates would have limited effect on water treatment needs because diversion from industrial supply wells or surface waters would be reduced to offset any increase dewatering production (Forest Service 2022e). Following Mine Year 6, predicted dewatering rates would decline removing most of the need for water treatment as water recycling would be needed to meet consumptive use demands, except during seasonal runoff periods when contact water volumes would increase. Any short-term volumes in excess of the water treatment capacity (i.e., following a large storm event) would result in water storage within the TSF and/or contact water ponds.

In the closure and post-closure periods, beginning in Mine Year 15, volume of mine-affected waters requiring water treatment would range seasonally up to approximately 1,000 gpm until geosynthetic cover installations (planned to commence in Mine Year 19) could be completed in Mine Year 23 to prevent mixing of surface water runoff and contact waters with consolidation water. Once the cover installations are in effect, volumes consisting of residual seepage and TSF consolidation water would continue to be treated but would decrease from approximately 200 gpm down to very minor, unmeasurable flow as the tailings solids consolidate and stop emitting water (Figure 4.9-9).
Figure 4.9-8
Predicted Groundwater Chemistry Underlying the Tailings Storage Facility
Stibnite Gold Project
Stibnite, ID

Data Source: (SRK 2021)
### Table 4.9-8 Predicted Groundwater Chemistry Underlying the TSF

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Existing alluvial groundwater chemistry under facility (MWH-A01)</th>
<th>Existing bedrock groundwater chemistry under facility (MWH-B01)</th>
<th>Operations</th>
<th>Post-Mining during Active Treatment</th>
<th>Post-Mining no Water Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Mine Year -2 to 12</td>
<td>Mine Year 13 to 40</td>
</tr>
<tr>
<td>pH</td>
<td>mg/L</td>
<td>6.5 - 8.5*</td>
<td>7.24</td>
<td>8.40</td>
<td>7.73</td>
<td>7.58</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>mg/L as CaCO$_3$</td>
<td>-</td>
<td>59.5</td>
<td>66.1</td>
<td>62.3</td>
<td>61.4</td>
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<tr>
<td>Ag</td>
<td>mg/L</td>
<td>0.1*</td>
<td>9.6E-06</td>
<td>9.8E-06</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>0.2*</td>
<td>0.017</td>
<td>0.011</td>
<td>0.0096</td>
<td>0.014</td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.013</td>
<td>0.0096</td>
<td>0.0089</td>
<td>0.012</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>-</td>
<td>0.0072</td>
<td>0.0088</td>
<td>0.0079</td>
<td>0.0077</td>
</tr>
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<td>Ba</td>
<td>mg/L</td>
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<td>0.0020</td>
<td>0.0036</td>
<td>0.0027</td>
<td>0.0025</td>
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<td>Be</td>
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<td>0.000009</td>
<td>0.000012</td>
<td>0.000001</td>
<td>0.000001</td>
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<tr>
<td>Ca</td>
<td>mg/L</td>
<td>-</td>
<td>17.8</td>
<td>18.9</td>
<td>18.3</td>
<td>18.2</td>
</tr>
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<td>Cd</td>
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<td>0.000010</td>
<td>0.000012</td>
<td>0.000001</td>
<td>0.000001</td>
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<td>Cl</td>
<td>mg/L</td>
<td>250*</td>
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<td>0.39</td>
<td>0.34</td>
<td>0.33</td>
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<tr>
<td>Co</td>
<td>mg/L</td>
<td>-</td>
<td>0.00010</td>
<td>0.00013</td>
<td>0.00010</td>
<td>0.00011</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.1</td>
<td>0.00029</td>
<td>0.00026</td>
<td>0.00028</td>
<td>0.00027</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>1.3</td>
<td>0.00048</td>
<td>0.00033</td>
<td>0.00043</td>
<td>0.00037</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>4</td>
<td>0.076</td>
<td>0.22</td>
<td>0.14</td>
<td>0.12</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
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<td>0.012</td>
<td>0.024</td>
<td>0.017</td>
<td>0.015</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.002</td>
<td>0.000005</td>
<td>0.000005</td>
<td>0.000014</td>
<td>0.000005</td>
</tr>
<tr>
<td>K</td>
<td>mg/L</td>
<td>-</td>
<td>0.77</td>
<td>0.67</td>
<td>0.73</td>
<td>0.69</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>-</td>
<td>1.47</td>
<td>1.89</td>
<td>1.66</td>
<td>1.62</td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>0.05*</td>
<td>0.00080</td>
<td>0.0011</td>
<td>0.00094</td>
<td>0.00091</td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
<td>-</td>
<td>0.0012</td>
<td>0.0060</td>
<td>0.0033</td>
<td>0.0027</td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>-</td>
<td>2.66</td>
<td>6.88</td>
<td>4.61</td>
<td>4.20</td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>-</td>
<td>0.00019</td>
<td>0.00022</td>
<td>0.00020</td>
<td>0.00020</td>
</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>-</td>
<td>0.017</td>
<td>0.017</td>
<td>0.017</td>
<td>0.017</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>0.015</td>
<td>0.00002</td>
<td>0.00003</td>
<td>0.00003</td>
<td>0.00003</td>
</tr>
<tr>
<td>Sb</td>
<td>mg/L</td>
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<td>0.0020</td>
<td>0.0043</td>
<td>0.0030</td>
<td>0.0028</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.00050</td>
<td>0.00050</td>
<td>0.00050</td>
<td>0.00050</td>
</tr>
<tr>
<td>SO$_4$</td>
<td>mg/L</td>
<td>250*</td>
<td>3.86</td>
<td>8.23</td>
<td>6.12</td>
<td>5.78</td>
</tr>
<tr>
<td>Tl</td>
<td>mg/L</td>
<td>0.002</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>0.00031</td>
<td>0.00032</td>
<td>0.00032</td>
<td>0.00032</td>
</tr>
<tr>
<td>Parameter</td>
<td>Units</td>
<td>Idaho Groundwater Quality Standard (IDAPA 58.01.11)</td>
<td>Existing alluvial groundwater chemistry under facility (MWH-A01)</td>
<td>Existing bedrock groundwater chemistry under facility (MWH-B01)</td>
<td>Operations Mine Year -2 to 12</td>
<td>Post-Mining during Active Treatment Mine Year 13 to 40</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Average</td>
<td>Minimum</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>5*</td>
<td>0.00087</td>
<td>0.0014</td>
<td>0.0011</td>
<td>0.0010</td>
</tr>
<tr>
<td>NO₂ + NO₃</td>
<td>mg/L as N</td>
<td>10</td>
<td>0.49</td>
<td>0.81</td>
<td>0.62</td>
<td>0.58</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500*</td>
<td>63.1</td>
<td>76.9</td>
<td>69.4</td>
<td>68.1</td>
</tr>
</tbody>
</table>

*All values are for the dissolved fraction unless otherwise noted.
- Indicates no guideline for parameter
* Indicates secondary groundwater standard
Figure 4.9-9
Predicted Water Treatment Volumes
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
Predicted maximum analyte concentrations were developed for water treatment plant influent on an annual basis for the construction, operations, and post-closure periods (Brown and Caldwell 2021b and SRK 2021a). In addition to influent flow rates, the maximum influent concentrations are relevant to the selection and design of the water treatment system and are summarized in Table 4.9-9.

Table 4.9-9 Predicted Maximum Concentrations in Water Treatment Plant Influent

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Construction</th>
<th>Operations</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (range)</td>
<td>s.u.</td>
<td>6.9 – 7.6</td>
<td>8.1 – 8.5</td>
<td>8.0 – 8.4</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>mg/L as CaCO₃</td>
<td>233</td>
<td>159</td>
<td>155</td>
</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.005</td>
<td>0.0012</td>
<td>0.0055</td>
</tr>
<tr>
<td>Aluminum</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>30.08</td>
<td>6.43</td>
<td>6.35</td>
</tr>
<tr>
<td>Boron</td>
<td>mg/L</td>
<td>4.89</td>
<td>2.34</td>
<td>0.53</td>
</tr>
<tr>
<td>Barium</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.04</td>
<td>0.11</td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/L</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Calcium</td>
<td>mg/L</td>
<td>14</td>
<td>22</td>
<td>422</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.0032</td>
<td>0.0015</td>
<td>0.00035</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/L</td>
<td>40</td>
<td>34</td>
<td>58</td>
</tr>
<tr>
<td>Cobalt</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.03</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>4.8</td>
<td>4.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/L</td>
<td>&lt;0.01</td>
<td>0.12</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/L</td>
<td>0.0003</td>
<td>0.0006</td>
<td>0.0151</td>
</tr>
<tr>
<td>Potassium</td>
<td>mg/L</td>
<td>103</td>
<td>41</td>
<td>113</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>123</td>
<td>76</td>
<td>232</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>0.11</td>
<td>0.27</td>
<td>0.29</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>mg/L</td>
<td>0.02</td>
<td>0.21</td>
<td>0.019</td>
</tr>
<tr>
<td>Sodium</td>
<td>mg/L</td>
<td>96</td>
<td>131</td>
<td>3,181</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>mg/L</td>
<td>4.1</td>
<td>1.7</td>
<td>0.25</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/L</td>
<td>0.037</td>
<td>0.019</td>
<td>0.004</td>
</tr>
<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>8.51</td>
<td>2.37</td>
<td>0.96</td>
</tr>
<tr>
<td>Selenium</td>
<td>mg/L</td>
<td>0.004</td>
<td>0.003</td>
<td>0.001</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>331</td>
<td>323</td>
<td>7,508</td>
</tr>
<tr>
<td>Thallium</td>
<td>mg/L</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0025</td>
</tr>
<tr>
<td>Vanadium</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Construction</th>
<th>Operations</th>
<th>Post-Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>0.198</td>
<td>0.241</td>
<td>0.055</td>
</tr>
<tr>
<td>Nitrate/Nitrite</td>
<td>mg/L as N</td>
<td>401</td>
<td>38</td>
<td>9</td>
</tr>
<tr>
<td>Ammonia</td>
<td>mg/L as N</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Cyanide, Total</td>
<td>mg/L</td>
<td>-</td>
<td>-</td>
<td>0.119</td>
</tr>
<tr>
<td>Cyanide, WAD</td>
<td>mg/L</td>
<td>-</td>
<td>-</td>
<td>0.073</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>-</td>
<td>-</td>
<td>11,371</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021b

The differences in major ion composition of water treatment influent in the post-closure period are due to the routing of TSF water inventory and tailings consolidation water from the facility for treatment.

To meet applicable discharge standards, the target post-treatment concentrations for analytes were identified for the water treatment plant design (Table 4.9-10).

**Table 4.9-10  Target Post-Water Treatment Plant Effluent Analyte Concentrations**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Treatment Objective&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (range)</td>
<td>s.u.</td>
<td>6.9 – 9.0</td>
</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.0007</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>0.01</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.00033</td>
</tr>
<tr>
<td>Chromium (III)</td>
<td>mg/L</td>
<td>0.035</td>
</tr>
<tr>
<td>Chromium (IV)</td>
<td>mg/L</td>
<td>0.0106</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/L</td>
<td>0.000012</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>0.024</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/L</td>
<td>0.0009</td>
</tr>
<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.0052</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>250</td>
</tr>
<tr>
<td>Thallium</td>
<td>mg/L</td>
<td>0.005</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>0.054</td>
</tr>
<tr>
<td>Nitrate/Nitrite</td>
<td>mg/L as N</td>
<td>10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>mg/L as N</td>
<td>2.1</td>
</tr>
<tr>
<td>Cyanide, Total</td>
<td>mg/L</td>
<td>0.0052</td>
</tr>
<tr>
<td>Cyanide, WAD</td>
<td>mg/L</td>
<td>0.0039</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021b

<sup>1</sup>Treatment objectives are equivalent to the strictest potentially applied water quality standard
During colder months (October through April), the temperature of treated water is estimated to be 7.3°C (Brown and Caldwell 2021b). During the operational period Mine Years 4 through 6 when water treatment plant discharge is between seven and 55 percent of the Meadow Creek flow, the discharge would increase stream temperature in Meadow Creek by one to three degrees Celsius. During warmer months, retention times for contact water in ponds would be up to 34 days resulting in warmer water treatment plant feeds with the potential to increase Meadow Creek temperatures downstream of the treatment plant outfall by up to 2.5°C. However, warmer water treatment plant discharge temperatures would be offset by the cooling effect of the piped diversion of Meadow Creek around the TSF with the net effect of water treatment on temperature of Meadow Creek expected to be less than 0.25°C (Brown and Caldwell 2021b).

Brown and Caldwell (2021c) performed an assessment of the viability of potentially applicable water treatment technologies to the predicted maximum influent water chemistry and identified the following technologies to incorporate into the proposed project design for the construction, operational, and post-closure periods.

Temporary treatment systems would be employed during the construction period until the project’s water treatment plant would be constructed and commissioned. These temporary systems would utilize trailer-mounted or skid-mounted equipment packages containing membrane treatment and/or iron coprecipitation systems that can be set up with limited lead time. Figure 4.9-10 illustrates the construction period water treatment flowsheet.

Figure 4.9-11 illustrates the operational period water treatment plan flowsheet with a design capacity of 2,000 gpm. For the operational period water chemistry, a treatment process consisting of sodium hypochlorite oxidation, two-stage iron coprecipitation with ferric sulfate, and solids separation with contingent mercury precipitation via organic sulfide precipitant addition between iron precipitation stages was selected. Influent waters would be stored in lined storage ponds for flow equalization and pumped into the water treatment plant. This operational water treatment generally targets dissolved nitrate, metals, and oxyanions in influent solution, primarily arsenic and antimony. Addition of the mercury-sequestering precipitant is included as a contingency for the design to account for uncertainties regarding the effectiveness of iron coprecipitation in reducing dissolved mercury and methylmercury concentrations to levels below applicable receiving stream standards. Residual solids from the treatment plant would be placed in the TSF.

Under an IPDES permit, the water treatment plant effluent would be directed to Meadow Creek at a location upstream of the Hangar Flats pit when flow augmentation is required and otherwise to the East Fork SFSR for the remainder of operations (i.e., when Hangar Flats groundwater pumping results in decreased Meadow Creek baseflow). For predicting surface water chemistry incorporating the effects of treated effluent, the minimum of the predicted water treatment plant influent analyte concentrations or the target effluent concentrations was used. Constituents that do not have a target effluent concentration were assumed to be unaffected by the treatment process.

For the post-closure period, the water treatment process would need to be augmented to treat cyanide, sulfate, and TDS concentrations that would be derived from the remaining inventory of TSF process water and tailings consolidation seepage (Figure 4.9-12). The first-stage iron coprecipitation would be
modified to include gypsum precipitation to reduce sulfate concentrations. The second-stage iron coprecipitation would then be converted to ettringite precipitation which would reduce sulfate and TDS concentrations to the target levels for treatment plan effluent. Cyanide would be treated using a two-stage alkaline oxidation process that converts cyanide to carbon dioxide, nitrogen gas, and water. Treatment plant residual solids would be placed in the TSF until its cover was completed, and thereafter dewatered and disposed of in a location constructed in the TSF above the cover.

At the start of closure, water treatment plant effluent would be discharged to the East Fork SFSR until the cover of the TSF is completed (approximately nine years to allow for tailings consolidation, cover installation, and stream channel restoration). Once the TSF cover is completed, the treatment plant and discharge would be relocated to Meadow Creek, nearer the TSF, for the duration of its operation (to approximately Mine Year 40).

The effects of capture, treatment, and discharge of mine-impacted waters on surface water chemistry would be minor, long-term, and localized.

**Sanitary Wastewater Treatment**

The worker housing, administration building, warehouse, maintenance shops, and underground exploration surface facilities would produce sanitary wastewater. Wastewater from the administration building, warehouse, maintenance shops, and underground facility would be collected in tanks for transport to a sanitary wastewater treatment plant equipped with a septage receiving system located near the worker housing facility. The sanitary wastewater treatment plant would consist of a package plant containing a membrane bioreactor or equivalent system to treat wastewater to applicable discharge permit requirements. The volume of wastewater influent would depend on the number of personnel working on site and is expected to be approximately 50,000 gallons per day (gpd) during the construction period and 25,000 gpd during operations (Brown and Caldwell 2021b).

Sanitary wastewater treatment plant effluent would be discharged to the East Fork SFSR at an IPDES permitted location near the worker housing facility. Treatment residuals would be dewatered and transported to a permitted, off-site landfill for disposal.

The effects of sanitary wastewater treatment and discharge would be minor, long-term, and localized.
Figure 4.9-10
Construction Period Water Treatment Plant Flowsheet

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a)
Operational Water Treatment Plant Flowsheet

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2021a)
Figure 4.9-12
Closure Period Water Treatment Plant Flowsheet
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2021a)
**IPDES Permits and Cyanidation Permit**

The State of Idaho has regulatory authority over its IPDES process. The SGP would need permits issued by the IDEQ to discharge treated water from its water treatment plant and sanitary wastewater treatment plant. Under the IPDES program, IDEQ would establish specific discharge limits for constituents of interest plus monitoring and reporting requirements for the system based on its regulatory criteria.

The SGP would also need a Cyanidation Permit issued by IDEQ to allow the use of cyanide in its ore processing. Under this permit, IDEQ would institute permit obligations regarding the handling and containment of process solutions as well as responses to upset conditions. In addition, the permit would also contain requirements for the ultimate treatment and disposal of process water. The descriptions of handling TSF water in this specialist report are consistent with the requirements of the Cyanidation Permit regulations.

This analysis of water quality utilizes the predicted water chemistries for water treatment plant discharges as developed by SRK (2021a) and Brown and Caldwell (2021c). Additional limits and requirements associated with the IPDES and Cyanidation Permit have not been determined at the time of this analysis and are therefore not incorporated.

**West End Pit Lake Chemistry**

During mine operations, the West End pit is expected to be relatively dry, and limited water from stormwater runoff and passive groundwater inflows would pond within the pit sump and be removed. At the end of open pit mine operations, dewatering would cease, diversions would be breached, and a pit lake would ultimately form in the pit. A conceptual geochemical model ([Figure 4.9-13](#)) has been developed for the West End pit lake from a review of the hydrologic model (Brown and Caldwell 2021e).

During the operational period, highwall runoff, bedrock seepage and run on from undisturbed ground would report to the pit sump as part of the pit dewatering system. Once dewatering ceases, the West End pit lake would begin to fill slowly until attaining a maximum volume of approximately 2,700 acre-feet and a surface elevation of 6,663 feet amsl approximately 57 years from the start of filling. Thereafter, the lake volume and surface elevation would vary at slightly lower levels as meteoric inflows varied in relation to outflows to bedrock groundwater. The final pit lake surface elevations are predicted to be more than six feet below the level where outflow from the pit lake to surface water would be anticipated.

Bedrock groundwater inflow and pit wall runoff are the main contributors to early pit lake filling. After infilling for approximately 11 years, direct precipitation on the pit lake surface would become equivalent to pit wall runoff, while groundwater inflow declines.

Solute loading into the pit lake would come from groundwater and pit wall runoff. These waters would pick up additional solute loading from fractures in the pit walls and talus remaining on pit benches. Representative leachate chemistry for the pit wall rock and talus were obtained from humidity cell tests of West End pit samples, scaled to field conditions.

The USGS code PHREEQC was used to perform a quantitative prediction of future West End pit lake water chemistry based on equilibrium of influent precipitation, groundwater, and rock leachate.
chemistries in equilibrium with solid phase minerals that act as solubility controls for dissolved constituents in aqueous systems (Table 4.9-11).

**Table 4.9-11 Equilibrium Phases Used for PHREEQC Water Chemistry Models**

<table>
<thead>
<tr>
<th>Mineral Phases Allowed to Form in PHREEQC</th>
<th>Ideal Mineral Formula</th>
<th>Rationale for Inclusion in Facility Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barite</td>
<td>BaSO₄</td>
<td>Primary mineralogic control on barium (Eary 1999). Close to saturation in initial model runs.</td>
</tr>
<tr>
<td>Calcite</td>
<td>CaCO₃</td>
<td>Mineral observed in Project area (M3 2020; SRK 2021a). Primary mineralogic control on calcium at alkaline pH (Eary 1999).</td>
</tr>
<tr>
<td>Goethite</td>
<td>FeOOH</td>
<td>Primary mineralogic control on iron chemistry and on the sorption of trace elements. Thermodynamic properties well defined (Dzombak and Morel 1990). Mineral observed in the Project area (SRK 2021a).</td>
</tr>
<tr>
<td>Fluorite</td>
<td>CaF₂</td>
<td>Primary mineralogic control on fluoride at neutral to alkaline pH (Eary 1999).</td>
</tr>
<tr>
<td>Gibbsite</td>
<td>Al(OH)₃</td>
<td>Primary mineralogic control on aluminum at neutral to alkaline pH (Eary 1999).</td>
</tr>
<tr>
<td>Gypsum</td>
<td>CaSO₄.2H₂O</td>
<td>Mineral observed in Project area (SRK 2021a). Primary mineralogic control on sulfate (Eary 1999).</td>
</tr>
<tr>
<td>Hgmetal(l)</td>
<td>Hg₂</td>
<td>Close to saturation in initial model runs.</td>
</tr>
<tr>
<td>Malachite</td>
<td>Cu₂(CO₃)(OH)₂</td>
<td>Primary mineralogic control on copper at alkaline pH (Eary 1999).</td>
</tr>
<tr>
<td>Rhodochrosite</td>
<td>MnCO₃</td>
<td>Primary mineralogic control on manganese at alkaline pH (Eary 1999). Close to saturation in initial model runs.</td>
</tr>
<tr>
<td>Senarmontite</td>
<td>Sb₂O₅</td>
<td>Mineral observed in the Project area (SRK 2021a).</td>
</tr>
</tbody>
</table>

Source: SRK 2021a

The pit lake is expected to turn over seasonally and remain in an oxidizing redox condition. Further details for the pit lake chemistry prediction are available in Site-Wide Water Chemistry Report (SRK 2021a).

Predicted West End pit lake water chemistry exhibits circumneutral pH conditions with TDS concentrations below 130 mg/L. Constituent concentrations are generally below the strictest potentially applied water quality standards except for antimony, arsenic, and mercury concentrations that exceed those values throughout the operating and closure period (Figure 4.9-14 and Table 4.9-12).

Concentrations of copper and lead are predicted to exceed the strictest potentially applied water quality standards during pit dewatering operations, when produced water is routed for consumptive use and water treatment but decrease below those levels during as the lake fills.
Figure 4.9-13
Conceptual Model - West End Pit Lake
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
Figure 4.3-14
Predicted West End Pit Lake Chemistry
Stibnite Gold Project
Stibnite, ID

Data Sources: (Q4R 2019)
Table 4.9-12  Summary of Results for West End Pit Sump and Pit Lake Geochemical Model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Strictest Potentially Applicable Surface Water Quality Standard*</th>
<th>Mine Year 4 (Pit Sump)</th>
<th>Mine Year 6 (Pit Sump)</th>
<th>Mine Year 10 (Pit Sump)</th>
<th>Mine Year 13 (Pit Lake)</th>
<th>Mine Year 25 (Pit Lake)</th>
<th>Mine Year 50 (Pit Lake)</th>
<th>Mine Year 100 (Pit Lake)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>s.u.</td>
<td>6.5 to 9.0</td>
<td>7.95</td>
<td>8.33</td>
<td>8.57</td>
<td>8.4</td>
<td>8.3</td>
<td>8.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>mg/L as CaCO₃</td>
<td>&gt;20</td>
<td>16.5</td>
<td>40.4</td>
<td>74</td>
<td>89</td>
<td>71</td>
<td>53</td>
<td>40</td>
</tr>
<tr>
<td>Ag</td>
<td>mg/L</td>
<td>0.0007 †</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>0.0000208</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>0.05</td>
<td>&lt;0.002</td>
<td>0.0032</td>
<td>0.0051</td>
<td>0.0037</td>
<td>0.0033</td>
<td>0.0028</td>
<td>0.0023</td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.050</td>
<td>0.12</td>
<td>0.31</td>
<td>0.11</td>
<td>0.13</td>
<td>0.11</td>
<td>0.09</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>--</td>
<td>0.044</td>
<td>0.11</td>
<td>0.27</td>
<td>0.1</td>
<td>0.12</td>
<td>0.1</td>
<td>0.088</td>
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<td>mg/L</td>
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<td>0.016</td>
<td>0.040</td>
<td>0.024</td>
<td>0.019</td>
<td>0.017</td>
<td>0.013</td>
</tr>
<tr>
<td>Be</td>
<td>mg/L</td>
<td>--</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
</tr>
<tr>
<td>Ca</td>
<td>mg/L</td>
<td>--</td>
<td>3.87</td>
<td>9.16</td>
<td>11.3</td>
<td>19</td>
<td>15</td>
<td>12</td>
<td>8.4</td>
</tr>
<tr>
<td>Cd</td>
<td>mg/L</td>
<td>0.00033 †</td>
<td>&lt;0.00002</td>
<td>0.000035</td>
<td>0.00009</td>
<td>0.000036</td>
<td>0.00004</td>
<td>0.000032</td>
<td>0.000026</td>
</tr>
<tr>
<td>Cl</td>
<td>mg/L</td>
<td>230</td>
<td>&lt;0.4</td>
<td>0.44</td>
<td>0.97</td>
<td>0.45</td>
<td>0.51</td>
<td>0.46</td>
<td>0.43</td>
</tr>
<tr>
<td>Co</td>
<td>mg/L</td>
<td>--</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.0106 †††</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
<td>&lt;0.00002</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>0.002 ††</td>
<td>0.00074</td>
<td>0.0020</td>
<td>0.0027</td>
<td>0.0014</td>
<td>0.0015</td>
<td>0.0015</td>
<td>0.0013</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.3</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
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<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.000012</td>
<td>3.62E-06</td>
<td>8.77E-06</td>
<td>0.000022</td>
<td>0.000033</td>
<td>0.000025</td>
<td>0.000017</td>
<td>0.000013</td>
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<tr>
<td>K</td>
<td>mg/L</td>
<td>--</td>
<td>0.56</td>
<td>1.31</td>
<td>3.30</td>
<td>1.8</td>
<td>1.8</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>--</td>
<td>2.25</td>
<td>5.41</td>
<td>13.8</td>
<td>10</td>
<td>9.2</td>
<td>6.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.0019</td>
<td>0.0046</td>
<td>0.012</td>
<td>0.0047</td>
<td>0.0053</td>
<td>0.0048</td>
<td>0.004</td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
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<td>&lt;0.00005</td>
<td>&lt;0.00005</td>
<td>&lt;0.00005</td>
<td>0.000058</td>
<td>&lt;0.00005</td>
<td>&lt;0.00005</td>
<td>&lt;0.00005</td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>--</td>
<td>0.44</td>
<td>0.883</td>
<td>2.06</td>
<td>0.93</td>
<td>1.1</td>
<td>0.95</td>
<td>0.86</td>
</tr>
<tr>
<td>Parameter</td>
<td>Units</td>
<td>Strictest Potentially Applicable Surface Water Quality Standard*</td>
<td>Mine Year 4 (Pit Sump)</td>
<td>Mine Year 6 (Pit Sump)</td>
<td>Mine Year 10 (Pit Sump)</td>
<td>Mine Year 13 (Pit Lake)</td>
<td>Mine Year 25 (Pit Lake)</td>
<td>Mine Year 50 (Pit Lake)</td>
<td>Mine Year 100 (Pit Lake)</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>---------------------------------------------------------------</td>
<td>------------------------</td>
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<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>0.024 †</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
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</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>--</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
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<tr>
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<td>121</td>
<td>130</td>
<td>110</td>
<td>81</td>
<td>61</td>
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<tr>
<td>NO₃ + NO₂</td>
<td>mg/L as N</td>
<td>--</td>
<td>0.239</td>
<td>0.445</td>
<td>0.354</td>
<td>0.23</td>
<td>0.13</td>
<td>0.075</td>
<td>&lt;0.05</td>
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</tbody>
</table>

All values are for the dissolved fraction unless otherwise noted
-- Indicates no guideline for parameter
† Indicates hardness-dependent parameter. The values listed are based on the East Fork SFSR hardness of 40 mg/L as calcium carbonate, which represents the 5th percentile hardness during the driest four months at node YP-SR-10 (East Fork SFSR below Meadow Creek) between April 2012 and May 2019.
†† Estimated criterion based on DEQ guidance on Biotic Ligand Model and limited site-specific SGP data
††† Standard is for chromium VI and is based on Water Effect Ratio
Shading indicates value is greater than the strictest potentially applicable surface water quality standard
Operational and post-closure water quality predictions have been developed for the Midnight, Yellow Pine, and Hangar Flats pits, which would be backfilled with development rock once the active mining phase is concluded in each pit. Predictions have been developed for sump chemistry for their mining periods and backfill porewater chemistry once backfill placement begins. During mine operations, active dewatering would keep the Yellow Pine and Hangar Flats and Yellow Pine pits dry and limited water would pond within pit sumps. The Midnight area pit is located above groundwater level, so would not require dewatering. The development rock backfill for the Midnight pit is to be sourced mostly from West End pit, with quantities from the West End pit and Yellow Pine pit in the Hangar Flats backfill, and from the Yellow Pine and Hangar Flats pits in the Yellow Pine backfill (Table 3.9-2). At the end of open pit mining and backfilling operations, dewatering would cease and the water table would rebound, partially flooding the backfill material within the Hangar Flats and Yellow Pine pits. Midnight pit backfill would be mounded at closure to promote runoff and the highwall and backfill material would be unsaturated.

In order to develop estimates of future porewater chemistry within the three pit backfills, conceptual geochemical models have been developed (Figure 4.9-15). Solute loading within the backfilled pits would come from the development rock backfill and from any talus remaining on the pit benches. There would be additional solute loading from groundwater (in the cases of Hangar Flats pit and Yellow Pine pit) and direct precipitation that contacts exposed pit walls and backfill. These waters would pick up additional solute loading from fractures in the pit walls.

Representative leachate chemistry for the non-PAG and PAG pit wall rock, talus and backfill material were obtained from humidity cell data associated with the backfill material and scaled to field conditions. The anticipated lithologies represented in the backfill material are summarized in Figure 4.9-16. The Yellow Pine pit would be backfilled from Mine Year 5 through Mine Year 11, with the Hangar Flats pit backfilled in Mine Years 6 and 7, and the Midnight pit backfilled in Mine Year 8. The conceptual models developed for each backfilled pit provide the basis for the development of quantitative predictive calculations using the USGS code PHREEQC.

A low permeability geosynthetic cover would be placed over the Hangar Flats and Yellow Pine pit backfills at closure and covered with earth. These covers are assumed to be 95 percent effective for inhibiting infiltration of meteoric waters from the ground surface into the backfill. A geosynthetic cover would not be placed on the Midnight Area pit backfill. Following installation of the covers, the Hangar Flats pit area would be revegetated and the diversion of Meadow Creek around the area would remain permanently. The East Fork SFSR stream channel would be restored above the Yellow Pine backfill cover along with the development of the Stibnite Lake feature. The restored streams, vegetation, and any wetland/riparian areas formed above the backfill covers would not interact with the development rock or groundwater below the covers. Influent water would inundate approximately 84 percent of backfill material in the Hangar Flats pit and 62 percent of backfill material in the Yellow Pine pit with recovered water levels more than 50 feet below the covers and local surface water.

Further details of the modeling are available in Brown and Caldwell 2021e and SRK 2021a.
Porewater in an unsaturated condition within the Midnight pit backfill is predicted to have alkaline pH with concentrations of antimony, arsenic, manganese, lead, sulfate, and TDS above groundwater standards (Table 4.9-13 and Figure 4.9-17). Surface grading and revegetation of the backfill would limit the potential for porewater within the Midnight pit backfill to infiltrate to local bedrock groundwater.

Table 4.9-13 Predicted Porewater Chemistry for Midnight Pit Backfill

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<th>Mine Year 12</th>
<th>Mine Year 25</th>
<th>Mine Year 50</th>
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<td>0.005</td>
<td>0.004</td>
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<td>-</td>
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All values are for the dissolved fraction unless stated otherwise. Shading indicates greater than Idaho Groundwater Quality Standard (IDAPA 58.01.11). * Indicates secondary guideline. - Indicates no standard for parameter.

The water chemistry in the inundated backfill within the Yellow Pine pit is predicted to have circumneutral pH with TDS below 180 mg/L. Antimony and arsenic concentrations are predicted to be above groundwater quality standards (Table 4.9-14 and Figure 4.9-18). Predicted mercury concentrations range from 30 ng/L in early years following inundation down to 9 ng/L after approximately 40 years. These mercury concentrations are below groundwater standards but notable because of the potential for groundwater discharge to surface waters.

The water chemistry in the inundated backfill within the Hangar Flats pit is predicted to have circumneutral pH with TDS below 120 mg/L. Antimony and arsenic concentrations are predicted to be above groundwater quality standards (Figure 4.9-19 and Table 4.9-15). Predicted mercury concentrations range from 5 ng/L in early years following inundation down to 2 ng/L after approximately 20 years. These mercury concentrations are less than groundwater standards but notable because of the potential for groundwater discharge and contribute constituents to surface waters.
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Project: Stibnite Gold Project
Stibnite, ID

Data Sources: (SRK 2021)

**Figure 4.9-15 Conceptual Model - Pit Backfills**

**Yellow Pine Backfilled Pit**
- Migration of precipitation / snowmelt waters through backfill
- Application of a low-permeability geosynthetic cover at closure

**Hangar Flats Backfilled Pit**
- Migration of precipitation / snowmelt waters through backfill
- Application of a low-permeability geosynthetic cover at closure

**Midnight Backfilled Pit**
- Migration of precipitation / snowmelt waters through backfill
- Application of a low-permeability geosynthetic cover at closure

**Stibnite Gold Project**
- Backfilled with 7.2 Mt (69.9%) of non-PAG development rock from West End pit
- Backfilled with 114 Mt of (98.3%) non-PAG development rock:
  - 77% from West End pit
  - 23% from Yellow Pine Pit

**Groundwater Inflow**
- 3.5% PAG in pit walls
- 6% PAG in final pit walls

**Groundwater Outflow**
- 90% from West End pit
- 5% from Hangar Flats pit
- 5% from Yellow Pine pit

**Evaporation**
- 0.1% PAG in final pit walls

**Seepage**
- Groundwater flow
- Mixing of TSF Buttress seepage and groundwater
- Infiltration into backfill (reduced by 95% following application of cover at closure)

**Highwall runoff**
- Rainfall / snowmelt into backfill

**Groundwater Flow**
- Groundwater inflow
- Diversion of Meadow Creek around pit

**Backfilled to an elevation of 1999 m amsl (6558 ft amsl)**
- 16% of backfill mass is above water level

**TSF Buttress**
- Application of a low-permeability geosynthetic cover at closure
- Backfilled with 17.2 Mt of (98%) non-PAG development rock:
  - 77% from West End Pit
  - 23% from Yellow Pine Pit
Figure 4.3-16
Pit Backfill Composition
Stibnite Gold Project
Stibnite, ID
Data Source: SRK 2021
Figure 4.3-17
Predicted Midnight Pit Backfill Porewater Chemistry
Stibnite Gold Project
Stibnite, ID
Data Source: (SRK 2021)
Table 4.9-14  Predicted Post-Closure Porewater Chemistry for Yellow Pine Pit Backfill

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<td>mg/L as CaCO₃</td>
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All values are for the dissolved fraction unless stated otherwise.
Shading indicates greater than Idaho Groundwater Quality Standard (IDAPA 58.01.11).
* Indicates secondary guideline.
- Indicates no standard for parameter.
Figure 4.9-18
Predicted Yellow Pine Pit Backfill Porewater Chemistry
Stibnite Gold Project
Stibnite, ID

Data Sources: (SRK 2021)
Figure 4.9-19
Predicted Hangar Flats Pit Backfill Porewater Chemistry
Stibnite Gold Project
Stibnite, ID
Data Source: (SRK 2021)
Table 4.9-15  Predicted Post-Closure Porewater Chemistry for Hangar Flats Pit Backfill

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</table>

All values are for the dissolved fraction unless stated otherwise.
Shading indicates greater than Idaho Groundwater Quality Standard (IDAPA 58.01.11).
* Indicates secondary guideline.
- Indicates no standard for parameter.
Groundwater Chemistry

Project effects on groundwater chemistry would be related to infiltration of leachate from the TSF, TSF Embankment and Buttress, stockpiles, and the Midnight pit backfill plus groundwater interaction with the inundated backfill within the Yellow Pine and Hangar Flats pits and groundwater outflow from the West End pit lake. In addition, accidental releases of fuels, lubricants, coolants, hydraulic fluid, and other chemicals could impact groundwater quality if not effectively addressed via designed containments and spill responses.

Effects of TSF, TSF Embankment and Buttress, and stockpiles leachate infiltration on receiving alluvial groundwater were summarized in Figures 4.9-4 and 4.9-8. Limited infiltration from the lined TSF results in minor changes to groundwater analyte concentrations under the TSF that do not result in exceedances of groundwater quality standards. Infiltration from the unlined TSF Buttress is predicted to have a more notable effect on groundwater analyte concentrations. Specifically, mixing of infiltrated leachate with previously unimpacted alluvial groundwater is predicted to increase antimony and arsenic groundwater concentrations above existing conditions and groundwater standards. However, infiltrating leachate would result in little change to the antimony and arsenic concentrations in currently impacted alluvial groundwater.

Where the local groundwater has not been previously impacted, the groundwater interactions with inundated backfill pore water and the West End pit lake would have the potential to increase groundwater concentrations for antimony and arsenic to levels above groundwater standards. Where the local groundwater is previously impacted, these groundwater interactions would have little influence on antimony and arsenic concentrations.

To assess the mixing and movement of dissolved constituents in groundwater, a particle tracking analysis was conducted using the site hydrogeologic model (Brown and Caldwell 2021e). Flow paths from origin locations within the TSF Buttress footprint and pit backfills were tracked over a period simulating 100 years following the end of dewatering operations and the particles were mapped at their final destinations over this time frame (Figure 4.9-20). The tracking analyses indicated that these destinations were typically surface stream segments in Meadow Creek, the East Fork SFSR, or Sugar Creek. Flow from the TSF Buttress footprint and the Hangar Flats backfill is predicted to be in an easterly to northeasterly direction toward the Meadow Creek area. The presence of a lined diversion channel for Meadow Creek inhibited discharge of groundwater to surface water along the length of the diversion. Groundwater discharge was predicted to occur primarily in Meadow Creek past the end of the lined diversion and prior to its confluence with the East Fork SFSR. Discharge of groundwater from these origin areas to the East Fork SFSR below the Meadow Creek confluence is predicted to occur to lesser extent than above the confluence. The effects of groundwater discharge on surface water chemistry are incorporated into the predicted analyte concentrations in surface water below.

Most of the groundwater movement from origin locations within the Yellow Pine pit backfill concludes as surface water discharge to the East Fork SFSR below the Yellow Pine pit area. However, approximately 10 percent of the groundwater flow discharges to surface water in Sugar Creek (Figure 4.9-20). Twenty-five percent of groundwater outflow from the West End pit lake discharges as surface water in West End Creek with the remainder discharging as surface water in Sugar Creek.
Existing groundwater monitoring data near the confluence of Meadow Creek and the East Fork SFSR exhibit antimony and arsenic concentrations above groundwater standards (Figures 3.9-8 and 3.9-9), indicating the mixture of leachate with these waters would result in little change to groundwater concentrations relative to standards. This is also the case with groundwater concentrations with the Sugar Creek drainage. Groundwater monitoring below the existing Yellow Pine pit indicates that there are zones of groundwater to the west of the East Fork SFSR channel (e.g., around MWH-A17 and SRK-GM-04S) where antimony and arsenic concentrations are below groundwater standards. Approximately two percent of the groundwater particles originating from the Yellow Pine pit backfill are predicted to reach those groundwater areas which could observe an associated increase in groundwater antimony and arsenic concentrations.

The effects of the infiltration of leachate from the TSF, TSF Buttress, stockpiles and Midnight pit backfill, groundwater interaction with the Yellow Pine and Hangar Flats pit backfills, and West End pit lake on groundwater chemistry would be minor to major depending on the existing condition of receiving groundwater, permanent, and localized. Major effects would be limited to the groundwater area (i.e., around MWH-A17 and SRK-GM-04S) where antimony and arsenic concentrations are below groundwater standards. The effects of groundwater discharge on surface water chemistry are incorporated into the predicted analyte concentrations in surface water in the following section.

**Surface Water Chemistry**

The results of the individual facility water chemistry models for the TSF, TSF Buttress, the backfilled Hangar Flats, Yellow Pine and Midnight pits, West End pit lake, and WTP effluent water quality were incorporated into a site-wide water chemistry (SWWC) model to provide an overall prediction of surface water concentrations in Meadow Creek, the East Fork SFSR, West End Creek and Sugar Creek (SRK 2021a). The water chemistry models were coupled with surface and groundwater flow predictions from the site-wide water balance and hydrogeological model (Brown and Caldwell 2021a, 2021e). The SWWC model quantifies surface water analyte concentrations at a series of prediction nodes downgradient of the mine facilities (Figure 4.9-21).

Constituent leaching from haul roads and access roads by meteoric and snowmelt runoff was evaluated using the site-wide water balance to estimate flows and humidity cell data to estimate runoff water chemistry. Details of the assessment can be found in SRK 2021a. Leachate chemistry from road surface materials is predicted have circumneutral pH with analyte concentrations below surface water standards. Use of chemical additives for dust control on roadways is not expected to add constituents to surface water. Dust control products, such as magnesium chloride, lignin sulfonate, or other appropriate and environmentally-acceptable products, to further enhance dust control at the site would be incorporated. The Forest Service would require that where haul roads pass within 25 feet (slope distance) of surface water, dust abatement would only be applied to a 10-foot swath down the centerline of the road. The rate and quantity of application would be regulated to ensure the chemical is absorbed before leaving the road surface. Therefore, effects of haul roads and access roads were not incorporated into the water chemistry modeling but were incorporated into the analysis of sediments and hazardous materials.
Figure 4.9-20
Predicted Groundwater Discharge to Surface Water
Stibnite Gold Project
Stibnite, ID
Data Sources: (Brown & Caldwell 2020)
Figure 4.9-21
Locations for Surface Water Chemistry Predictions
Stibnite Gold Project
Stibnite, ID

Operations refers to Mine Years -3 through 15.
Post-Closure refers to Mine Years 16 and beyond.

*Mine Site components are associated with 2021 MMP
Construction and operation of the Burntlog Maintenance Facility and the SGLF would have the potential for increased runoff, erosion, sedimentation (as a result of vegetation removal and excavation of soil, rock, and sediment) and fuel and/or material discharge to nearby waterbodies during operations (if not properly stored or contained). However, design features proposed by Perpetua, regulatory and Forest Plan requirements required by the Forest Service, and permit stipulations from state and federal agencies (including BMPs, sanitary wastewater, and SPCC Plan) would control runoff, erosion, sedimentation, and the potential for discharges. Therefore, effects of the Burntlog Maintenance Facility and the SGLF were considered to be negligible to surface water quality analysis.

Predicted water chemistry at the assessment nodes was determined by mixing the predicted mine-impacted water chemistry originated from the modeled project facilities with catchment runoff. Catchment runoff is the proportion of surface water flow derived from meteoric and snow melt runoff. Catchment runoff would consist of runoff from the disturbed ground associated with historical mine facilities and undisturbed native ground. The percentage of disturbed ground within the catchment of each prediction node is summarized in Table 4.9-16. Runoff from disturbed and undisturbed ground was assigned water chemistries associated with observed concentrations in water chemistry samples from the area. Additional details for this surface water chemistry modeling can be found in SRK 2021a.

Table 4.9-16  Summary of Disturbed Catchment Percentages

<table>
<thead>
<tr>
<th>Assessment Node</th>
<th>Watercourse</th>
<th>Disturbed Catchment (% of total catchment)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>0.3</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>0.4</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>3.0</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>0.9</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>0.8</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>1.5</td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>0.1</td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork SFSR</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*The proportions are not cumulative and are calculated using the disturbed area downstream of upstream assessment locations

Source: SRK 2021a

For predicting future surface water concentrations, disturbance associated with the SODA/Bradley tailings and Hecla Heap was not incorporated because those facilities are proposed to be reclaimed during operations. Conversely, reclamation of the Bradley dumps is not included in the model because that reclamation is not part of the 2021 MMP. Therefore, leachate from the Bradley dumps was incorporated in the model, and recharge estimates were assumed to remain the same as existing conditions during operations and post-operations.

To minimize the volumes of contact water encountering project disturbance and requiring treatment, the project would divert upstream non-contact water to prevent it from interacting with SGP facilities during operations. Table 4.9-17 provides a summary of the non-contact diversion channels that are considered in
the SWWC model. At closure, the diversion channels would be decommissioned, and non-contact water would follow its natural drainage pathways.

**Table 4.9-17 Summary of Diversion Channels included in the Surface Water Chemistry Model**

<table>
<thead>
<tr>
<th>Diversion Channel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Diversion</td>
<td>Diverts non-contact runoff from the north of the TSF and TSF Buttress to Meadow Creek</td>
</tr>
<tr>
<td>South Diversion</td>
<td>Diverts Meadow Creek and its tributaries from the south and west of the TSF around the TSF</td>
</tr>
<tr>
<td>Hennessy Diversion</td>
<td>Diverts water from Hennessy Creek away from the Yellow Pine pit to Fiddle Creek</td>
</tr>
<tr>
<td>Midnight Diversion</td>
<td>Diverts Midnight Creek away from the Yellow Pine pit to the East Fork SFSR</td>
</tr>
<tr>
<td>West End Diversion</td>
<td>Diverts upper West End Creek around the West End pit</td>
</tr>
<tr>
<td>East Fork SFSR Tunnel</td>
<td>Diverts the East Fork SFSR around the Yellow Pine pit downstream of YP-SR-6 to upstream of YP-SR-4</td>
</tr>
</tbody>
</table>

Source: SRK 2021a

Predicted surface water concentrations at node YP-T-22 on Meadow Creek downstream of the TSF and TSF Buttress are lower for most analytes compared to existing conditions (Table 4.9-18 and Figure 4.9-22). This prediction is related to the removal of historical unlined mine waste disposal areas from the Meadow Creek drainage and the construction of lined and covered facilities as part of the project. The exception to the reduced analyte concentrations are mercury concentrations which exhibit some variability during the operational and early closure periods attributable to predicted variations in effluent chemistry from the water treatment plant. Predicted long-term surface water mercury concentrations are comparable to the existing conditions at the location. Mercury concentrations remain below the most stringent applicable water quality standard under existing conditions and throughout the construction, operating and post-closure periods.

Immediately downstream of the Yellow Pine pit on the East Fork SFSR at node YP-SR-4 (above the confluence with Sugar Creek), predicted surface water chemistry is similar to existing conditions with some variability in predicted antimony, arsenic, and mercury concentrations during the operating and initial closure period (Table 4.9-19 and Figure 4.9-23). Compared to existing conditions, predicted surface water antimony concentrations are lower during the operating period due to the removal of unlined legacy mine wastes then increase slightly post-closure to a concentration below existing conditions as discharging groundwater chemistry is modified by interaction with the Yellow Pine pit backfill. Similarly, predicted arsenic concentrations decrease relative to existing conditions during the operating period then recover to a concentration below existing conditions in the post-closure period. Lastly, predicted mercury concentrations are slightly higher than existing conditions during the operating period due to variability in predicted effluent chemistry from the water treatment plant, then return to concentrations slightly higher than existing conditions post-closure. However, mercury concentrations remain below the most stringent applicable water quality standard under existing conditions and throughout the construction, operating and post-closure periods.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Existing Conditions Mine Year -37 to -3</th>
<th>Open Pit Mining Mine Year -2 to 12</th>
<th>Post-Mining during Water Treatment Mine Year 13 to 40</th>
<th>Post-Mining no Water Treatment Mine Year 41 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>mg/L</td>
<td>6.5 - 9</td>
<td>7.2</td>
<td>6.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>mg/L</td>
<td>&gt;20</td>
<td>46</td>
<td>24</td>
<td>58</td>
</tr>
<tr>
<td>Ag</td>
<td>mg/L</td>
<td>0.0007</td>
<td>0.000001</td>
<td>0.000099</td>
<td>0.000011</td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.01</td>
<td>0.006</td>
<td>0.026</td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.032</td>
<td>0.004</td>
<td>0.075</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>0.01</td>
<td>0.0074</td>
<td>0.0012</td>
<td>0.0016</td>
</tr>
<tr>
<td>Ba</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.0048</td>
<td>0.0026</td>
<td>0.0060</td>
</tr>
<tr>
<td>Be</td>
<td>mg/L</td>
<td>-</td>
<td>0.000096</td>
<td>0.000091</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ca</td>
<td>mg/L</td>
<td>-</td>
<td>14</td>
<td>6.3</td>
<td>18</td>
</tr>
<tr>
<td>Cd</td>
<td>mg/L</td>
<td>0.0033</td>
<td>0.000097</td>
<td>0.000094</td>
<td>0.00011</td>
</tr>
<tr>
<td>Cl</td>
<td>mg/L</td>
<td>230</td>
<td>2.3</td>
<td>0.24</td>
<td>5.4</td>
</tr>
<tr>
<td>Co</td>
<td>mg/L</td>
<td>-</td>
<td>0.00018</td>
<td>0.00021</td>
<td>0.00004</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.0106</td>
<td>0.0002</td>
<td>0.00013</td>
<td>0.00028</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>0.002</td>
<td>0.00034</td>
<td>0.00016</td>
<td>0.0002</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.11</td>
<td>0.085</td>
<td>0.15</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.3</td>
<td>0.053</td>
<td>0.0095</td>
<td>0.14</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.000012</td>
<td>0.000001</td>
<td>0.000048</td>
<td>0.000008</td>
</tr>
<tr>
<td>K</td>
<td>mg/L</td>
<td>-</td>
<td>0.97</td>
<td>0.05</td>
<td>1.4</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>-</td>
<td>2.1</td>
<td>1.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.024</td>
<td>0.001</td>
<td>0.056</td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
<td>-</td>
<td>0.0011</td>
<td>0.00059</td>
<td>0.00014</td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>-</td>
<td>2.7</td>
<td>1.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>0.024</td>
<td>0.00018</td>
<td>0.00011</td>
<td>0.00022</td>
</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>-</td>
<td>0.02</td>
<td>0.012</td>
<td>0.025</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>0.009</td>
<td>0.00018</td>
<td>0.000097</td>
<td>0.00011</td>
</tr>
<tr>
<td>Sb</td>
<td>mg/L</td>
<td>0.0052</td>
<td>0.0092</td>
<td>0.0014</td>
<td>0.0025</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>0.0035</td>
<td>0.0005</td>
<td>0.0005</td>
<td>0.0005</td>
</tr>
<tr>
<td>SO₄</td>
<td>mg/L</td>
<td>250</td>
<td>6.3</td>
<td>2.1</td>
<td>12</td>
</tr>
<tr>
<td>Ti</td>
<td>mg/L</td>
<td>0.000017</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.0001</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>0.00022</td>
<td>0.00015</td>
<td>0.00029</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>0.054</td>
<td>0.00081</td>
<td>0.00046</td>
<td>0.0018</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>57</td>
<td>27</td>
<td>80</td>
</tr>
<tr>
<td>NO₂ + NO₃</td>
<td>mg/L as N</td>
<td>-</td>
<td>0.5</td>
<td>0.022</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Source: SRK 2021a

Average, minimum and maximum values are calculated based on the monthly predicted concentrations over the indicated time period. Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria.
Table 4.9-19 Summary of Predicted Concentrations at YP‐SR‐4
Parameter

Units

Strictest Potentially
Applicable Surface Water
Quality Criteria

Average

Existing Conditions
Mine Year ‐37 to ‐3
Minimum

Maximum

Average

Open Pit Mining
Mine Year ‐2 to 12
Minimum

Maximum

Average

Minimum

Maximum

Average

Minimum

Maximum

Post‐Mining during Water Treatment
Mine Year 13 to 40

Post‐Mining no Water Treatment
Mine Year 41 to 112

pH

mg/L

6.5 - 9

7.3

7.0

7.5

7.3

7.0

7.5

7.3

7.0

7.5

7.3

6.9

7.4

Total Alkalinity

mg/L

>20

45

26

60

51

24

68

46

24

65

44

24

60

Ag

mg/L

0.0007

0.00001

0.0000098

0.000011

0.00001

0.0000063

0.000012

0.000011

0.0000063

0.000031

0.00001

0.0000057

0.000017

Al

mg/L

0.05

0.0091

0.0066

0.019

0.0086

0.004

0.019

0.0074

0.0043

0.02

0.007

0.0039

0.019

As

mg/L

0.01

0.064

0.019

0.12

0.025

0.013

0.097

0.035

0.013

0.063

0.034

0.014

0.06

B

mg/L

-

0.011

0.0096

0.012

0.013

0.0065

0.029

0.014

0.009

0.043

0.011

0.009

0.023

Ba

mg/L

2.0

0.014

0.006

0.021

0.0093

0.0055

0.019

0.0083

0.0053

0.013

0.008

0.0053

0.01

Be

mg/L

-

0.000012

0.00001

0.000015

0.00001

0.0000085

0.000014

0.000022

0.0000095

0.000083

0.000012

0.00001

0.000017

Ca

mg/L

-

15

6.7

18

13

6.3

17

10

5.9

16

10

5.9

15

Cd

mg/L

0.00033

0.00001

0.0000098

0.000011

0.000011

0.0000059

0.000018

0.000011

0.0000075

0.000023

0.00001

0.0000068

0.000015

Cl

mg/L

230

0.8

0.29

1.2

0.32

0.17

0.85

0.45

0.17

0.8

0.45

0.18

0.7

Co

mg/L

-

0.000096

0.000027

0.0002

0.000081

0.000015

0.00029

0.000174

0.000015

0.00085

0.000064

0.000013

0.00015

Cr

mg/L

0.0106

0.0002

0.00015

0.00029

0.00022

0.00011

0.00048

0.0002

0.00013

0.00045

0.00016

0.00012

0.00031

Cu

mg/L

0.002

0.00034

0.00021

0.0014

0.00034

0.00017

0.0012

0.0003

0.00017

0.00093

0.00027

0.00017

0.00083

F

mg/L

2.0

0.11

0.092

0.15

0.12

0.053

0.16

0.1

0.079

0.17

0.1

0.074

0.15

Fe

mg/L

0.3

0.027

0.013

0.041

0.015

0.01

0.027

0.014

0.0105

0.016

0.013

0.0109

0.015

Hg

mg/L

0.000012

0.0000012

0.00000017

0.000003

0.000002

0.00000046

0.0000034

0.0000019

0.000001

0.0000034

0.0000016

0.00000091

0.0000033

K

mg/L

-

0.92

0.58

1.1

0.9

0.56

1.3

0.76

0.55

1.4

0.72

0.55

1.0

Mg

mg/L

-

3.8

1.3

4.8

3.3

1.3

5.0

2.7

1.3

5

2.5

1.3

4.2

Mn

mg/L

0.05

0.022

0.0043

0.044

0.0043

0.00083

0.05

0.0053

0.0009

0.011

0.0054

0.00092

0.012

Mo

mg/L

-

0.00093

0.00052

0.0015

0.0013

0.00062

0.0037

0.0014

0.00061

0.007

0.0014

0.00088

0.0031

Na

mg/L

-

2.7

1.5

3.5

2.5

1.4

4.5

2.5

1.4

8

2.3

1.4

3.0

Ni

mg/L

0.024

0.00027

0.00011

0.0004

0.00032

0.00011

0.0012

0.00042

0.00011

0.00106

0.0004

0.00021

0.001

P

mg/L

-

0.028

0.018

0.039

0.02

0.014

0.036

0.024

0.014

0.054

0.019

0.013

0.028

Pb

mg/L

0.0009

0.000018

0.000011

0.00008

0.000034

0.00001

0.00014

0.000055

0.000013

0.0002

0.00004

0.000011

0.00018

Sb

mg/L

0.0052

0.033

0.0077

0.056

0.014

0.0049

0.063

0.013

0.005

0.023

0.013

0.0054

0.023

Se

mg/L

0.0031

0.0005

0.00049

0.00051

0.00049

0.00025

0.00051

0.00039

0.00029

0.00051

0.00038

0.00026

0.00049

SO4

mg/L

250

16

2.5

32

5.7

1.7

26

6.8

1.7

17

6.5

1.8

9.9

Tl

mg/L

0.000017

0.000012

0.00001

0.000013

0.000011

0.0000056

0.000014

0.0000085

0.0000063

0.000013

0.0000083

0.0000058

0.000013

V

mg/L

-

0.00017

0.00014

0.00022

0.00017

0.000127

0.00021

0.00027

0.00013

0.00087

0.00016

0.00013

0.00021

Zn

mg/L

0.054

0.0014

0.00065

0.0018

0.0011

0.00054

0.0031

0.0012

0.00064

0.0042

0.001

0.00061

0.002

TDS

mg/L

500

67

29

97

57

26

98

52

26

88

50

26

71

mg/L as N

-

0.42

0.27

0.62

0.6

0.32

2.3

0.44

0.36

0.65

0.43

0.35

0.56

NO2 + NO3

Source: SRK 2021a
Average, minimum and maximum values are calculated based on the monthly predicted concentrations over the indicated time period.
Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria.

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Immediately downstream of the West End pit on West End Creek at node YP-T-6 (above the confluence with Sugar Creek), predicted surface water chemistry is modified by diversion of West End Creek around the pit area and predicted operational period water chemistry is based observed analyte concentrations in West End Creek above the pit area (Table 4.9-20 and Figure 4.9-24). Compared to existing conditions, predicted surface water antimony concentrations are lower during the operating period due to the creek diversion then return to existing conditions during the closure period as a result of West End pit lake chemistry effects on surface water and groundwater. Similarly, predicted arsenic concentrations decrease relative to existing conditions during the operating period then recover to existing conditions in the post-closure period. Lastly, predicted mercury concentrations are an order of magnitude higher than existing conditions during the operating period due to the observed upper West End Creek concentrations, then return to existing conditions post-closure. During operations, mercury concentrations are greater than the most stringent applicable water quality standard because the surface water in upper West End Creek is above the standard under existing conditions. Post-closure mercury concentrations return to a level below the most stringent applicable water quality standard.

Downstream of the project on the East Fork SFSR at node YP-SR-2 (below the confluence with Sugar Creek), predicted surface water chemistry is largely unchanged from existing conditions with some variability in predicted antimony, arsenic, and mercury concentrations during the operating and initial closure period (Table 4.9-21 and Figure 4.9-25). Compared to existing conditions, predicted surface water antimony concentrations are lower during the operating period due to the removal of unlined legacy mine wastes then increase slightly post-closure to a concentration below existing conditions as recovering groundwater levels result in increased discharge to surface water. Similarly, predicted arsenic concentrations decrease relative to existing conditions during the operating period then recover to a concentration comparable to existing conditions in the post-closure period. Lastly, predicted mercury concentrations are slightly higher than existing conditions during the operating period due to variability in predicted effluent chemistry from the water treatment plant, then return to concentrations comparable to existing conditions post-closure. However, mercury concentrations remain below the most stringent applicable water quality standard under existing conditions and throughout the construction, operating and post-closure periods.

During operations, West End Creek would be diverted around the operations associated with the West End pit. Under existing conditions West End Creek has antimony and arsenic concentrations above stream surface water standards. Existing mercury concentrations in West End Creek are greater than standards above the West End pit area (approximately 50 ng/L) and less than standards below the pit area (approximately 4 ng/L). This suggests that a naturally-occurring mechanism reduces mercury concentrations in the creek between the sample locations upstream and downstream of the pit area.

Diversion of West End Creek around the pit area during operations has the potential to affect the naturally-occurring reduction in mercury concentrations, allowing higher upstream concentrations to appear in the downstream segment. Therefore, water chemistry forecasting conservatively utilizes the higher mercury concentrations from upstream of the pit area in assessing West End Creek and downstream mercury concentrations (SRK 2021a). However, predicted downstream mercury concentrations remain lower than surface water standards.
During the construction, operations, and post-closure periods, predicted water chemistry in Sugar Creek differs very little from baseline conditions (SRK 2021a). A slight predicted decrease in antimony concentrations (0.004 mg/L to 0.003 mg/L), a slight predicted increase in arsenic concentrations (0.013 mg/L to 0.014 mg/L), and a slight predicted increase in mercury concentrations (6 ng/L to 8 ng/L) are predicted in association with the closure of the Bailey Tunnel and the removal of its contributions to Sugar Creek chemistry plus the arrival of groundwater outflow from the West End pit lake in the post-closure period (SRK 2021a). Existing upstream contributions from Cinnabar Creek, a tributary to Sugar Creek, would continue to exert control on predicted Sugar Creek mercury concentrations in the operational and post-closure periods.

Effects of the project on surface water concentrations are expected to be negligible relative to applicable standards and calculated human health criteria, permanent, and localized. Effects of chemistry changes on fish and human health are described in Sections 4.12.2 and 4.18.2, respectively.

**Organic Carbon**

Sewage from the planned worker housing facility would be managed via a wastewater treatment plant that would discharge via a surface water outfall directly to the East Fork SFSR. A package plant consisting of a membrane bioreactor or equivalent system would treat the sanitary wastewater to meet applicable IPDES permit standards, and effluent would be discharged in an acceptable manner as approved by the permit. Sewage effluent systems would have waste containment and runoff control structures to prevent escape of untreated waste to the East Fork SFSR. The discharge volume from the wastewater treatment plant would vary between the mine construction, operation, and closure and reclamation periods, depending on the number of workers present at the SGP. However, the overall discharge rate from the plant is expected to be small relative to ambient flow in the East Fork SFSR (Brown and Caldwell 2020a).

Surface water quality changes resulting from the wastewater treatment plant discharge have not been calculated through modeling exercises. Qualitatively, operation of the wastewater treatment plant would incrementally increase organic carbon mass loading rates in the Headwater East Fork SFSR subwatershed. But the overall impact on organic carbon concentrations in the river are expected to be low given the small volume of wastewater effluent relative to average streamflow, and the planned adherence to IPDES permit limits for the treated water discharge.

Effects of the SGP on organic carbon in surface water are expected to be minor, long-term, and localized. An incremental increase in organic carbon content due to wastewater effluent (as described above) would yield an incremental increase in methylation potential (see below).

**Aerial Deposition**

Air emissions from the project have the potential to contribute metals to the ground surface via wet and dry deposition that have the potential to affect surface water chemistry. Most of these contributions would be in the form of particulate matter, but a portion of the local aerial deposition of mercury may also occur in elemental form. Total mercury emissions from the project are predicted to be approximately 13.6 pounds of mercury per year.
### Table 4.9-20 Summary of Predicted Concentrations at YP-T-6

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Applicable Surface Water Quality Criteria</th>
<th>Existing Conditions Mine Year -37 to -3</th>
<th>Open Pit Mining Mine Year -2 to 12</th>
<th>Post-Mining during Water Treatment Mine Year 13 to 40</th>
<th>Post-Mining no Water Treatment Mine Year 41 to 112</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Average</td>
<td>Minimum</td>
</tr>
<tr>
<td><strong>TDS mg/L</strong></td>
<td></td>
<td>0.0007</td>
<td>0.00001</td>
<td>0.000001</td>
<td>0.00001</td>
<td>0.000001</td>
</tr>
<tr>
<td><strong>V mg/L</strong></td>
<td></td>
<td>0.05</td>
<td>0.00001</td>
<td>0.000001</td>
<td>0.00001</td>
<td>0.000001</td>
</tr>
<tr>
<td><strong>Se mg/L</strong></td>
<td></td>
<td>0.01</td>
<td>0.0001</td>
<td>0.00001</td>
<td>0.0001</td>
<td>0.00001</td>
</tr>
<tr>
<td><strong>Sb mg/L</strong></td>
<td></td>
<td>0.012</td>
<td>0.013</td>
<td>0.0005</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td><strong>Pb mg/L</strong></td>
<td></td>
<td>0.01</td>
<td>0.016</td>
<td>0.018</td>
<td>0.01</td>
<td>0.016</td>
</tr>
<tr>
<td><strong>P mg/L</strong></td>
<td></td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
</tr>
<tr>
<td><strong>Ni mg/L</strong></td>
<td></td>
<td>0.011</td>
<td>0.012</td>
<td>0.012</td>
<td>0.01</td>
<td>0.011</td>
</tr>
<tr>
<td><strong>Na mg/L</strong></td>
<td></td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td><strong>Mo mg/L</strong></td>
<td></td>
<td>0.024</td>
<td>0.024</td>
<td>0.024</td>
<td>0.024</td>
<td>0.024</td>
</tr>
<tr>
<td><strong>As mg/L</strong></td>
<td></td>
<td>0.017</td>
<td>0.018</td>
<td>0.018</td>
<td>0.017</td>
<td>0.018</td>
</tr>
<tr>
<td><strong>Mo mg/L</strong></td>
<td></td>
<td>0.011</td>
<td>0.012</td>
<td>0.013</td>
<td>0.011</td>
<td>0.012</td>
</tr>
<tr>
<td><strong>Na mg/L</strong></td>
<td></td>
<td>0.0031</td>
<td>0.0031</td>
<td>0.0031</td>
<td>0.0031</td>
<td>0.0031</td>
</tr>
<tr>
<td><strong>SO4 mg/L</strong></td>
<td></td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Tl mg/L</strong></td>
<td></td>
<td>0.0017</td>
<td>0.0017</td>
<td>0.0017</td>
<td>0.0017</td>
<td>0.0017</td>
</tr>
<tr>
<td><strong>V mg/L</strong></td>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Zn mg/L</strong></td>
<td></td>
<td>0.041</td>
<td>0.041</td>
<td>0.041</td>
<td>0.041</td>
<td>0.041</td>
</tr>
<tr>
<td><strong>TDS mg/L</strong></td>
<td></td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
<tr>
<td><strong>NO3 mg/L</strong></td>
<td></td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Source: SRK 2021a
Average, minimum and maximum values are calculated based on the monthly predicted concentrations over the indicated time period. Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria.
Table 4.9-21 Summary of Predicted Concentrations at YP-SR.2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Mine Year</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>mg/L</td>
<td>-12</td>
<td>7.3</td>
<td>7.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>mg/L</td>
<td>&gt;25</td>
<td>49</td>
<td>29</td>
<td>60</td>
</tr>
<tr>
<td>Ag</td>
<td>mg/L</td>
<td>-</td>
<td>0.00001</td>
<td>0.0000099</td>
<td>0.000011</td>
</tr>
<tr>
<td>Al</td>
<td>mg/L</td>
<td>-</td>
<td>0.0079</td>
<td>0.0051</td>
<td>0.017</td>
</tr>
<tr>
<td>As</td>
<td>mg/L</td>
<td>-</td>
<td>0.045</td>
<td>0.014</td>
<td>0.076</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.013</td>
<td>0.0067</td>
<td>0.018</td>
</tr>
<tr>
<td>Ba</td>
<td>mg/L</td>
<td>-</td>
<td>0.000011</td>
<td>0.00001</td>
<td>0.00013</td>
</tr>
<tr>
<td>Be</td>
<td>mg/L</td>
<td>-</td>
<td>16</td>
<td>8.3</td>
<td>18</td>
</tr>
<tr>
<td>Cd</td>
<td>mg/L</td>
<td>-</td>
<td>0.000018</td>
<td>0.000011</td>
<td>0.00013</td>
</tr>
<tr>
<td>Cl</td>
<td>mg/L</td>
<td>-</td>
<td>230</td>
<td>0.25</td>
<td>0.87</td>
</tr>
<tr>
<td>Co</td>
<td>mg/L</td>
<td>-</td>
<td>0.000072</td>
<td>0.00002</td>
<td>0.0014</td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>-</td>
<td>0.00017</td>
<td>0.00014</td>
<td>0.0023</td>
</tr>
<tr>
<td>Cu</td>
<td>mg/L</td>
<td>-</td>
<td>0.00032</td>
<td>0.00023</td>
<td>0.0098</td>
</tr>
<tr>
<td>F</td>
<td>mg/L</td>
<td>2.0</td>
<td>0.012</td>
<td>0.011</td>
<td>0.15</td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.3</td>
<td>0.021</td>
<td>0.012</td>
<td>0.029</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/L</td>
<td>0.000012</td>
<td>0.000048</td>
<td>0.000032</td>
<td>0.0000096</td>
</tr>
<tr>
<td>K</td>
<td>mg/L</td>
<td>-</td>
<td>0.87</td>
<td>0.57</td>
<td>1.0</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>-</td>
<td>3.7</td>
<td>1.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Mn</td>
<td>mg/L</td>
<td>-</td>
<td>0.014</td>
<td>0.0028</td>
<td>0.028</td>
</tr>
<tr>
<td>Mo</td>
<td>mg/L</td>
<td>-</td>
<td>0.00099</td>
<td>0.00059</td>
<td>0.0014</td>
</tr>
<tr>
<td>Na</td>
<td>mg/L</td>
<td>-</td>
<td>2.6</td>
<td>1.5</td>
<td>3.2</td>
</tr>
<tr>
<td>Ni</td>
<td>mg/L</td>
<td>-</td>
<td>0.0024</td>
<td>0.0018</td>
<td>0.031</td>
</tr>
<tr>
<td>P</td>
<td>mg/L</td>
<td>-</td>
<td>0.0022</td>
<td>0.0052</td>
<td>0.037</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>-</td>
<td>0.00018</td>
<td>0.00011</td>
<td>0.00056</td>
</tr>
<tr>
<td>Sb</td>
<td>mg/L</td>
<td>-</td>
<td>0.0005</td>
<td>0.00049</td>
<td>0.005</td>
</tr>
<tr>
<td>Se</td>
<td>mg/L</td>
<td>-</td>
<td>250</td>
<td>14</td>
<td>3.2</td>
</tr>
<tr>
<td>SO₄²⁻</td>
<td>mg/L</td>
<td>-</td>
<td>0.000017</td>
<td>0.000012</td>
<td>0.000014</td>
</tr>
<tr>
<td>Ti</td>
<td>mg/L</td>
<td>-</td>
<td>0.00016</td>
<td>0.00014</td>
<td>0.0019</td>
</tr>
<tr>
<td>V</td>
<td>mg/L</td>
<td>-</td>
<td>0.00016</td>
<td>0.00014</td>
<td>0.0019</td>
</tr>
<tr>
<td>Zn</td>
<td>mg/L</td>
<td>0.054</td>
<td>0.0011</td>
<td>0.00064</td>
<td>0.0014</td>
</tr>
<tr>
<td>TDS</td>
<td>mg/L</td>
<td>500</td>
<td>67</td>
<td>33</td>
<td>87</td>
</tr>
<tr>
<td>NO₃⁻ + NO₂⁻</td>
<td>mg/L as N</td>
<td>-</td>
<td>0.49</td>
<td>0.32</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Source: SRK 2021a

Average, minimum and maximum values are calculated based on the monthly predicted concentrations over the indicated time period. Shading indicates value is greater than Strictest Potentially Applicable Surface Water Quality Criteria.
Figure 4.9-22
Predicted Surface Water Chemistry Downstream of the Tailings Storage Facility and Buttress (YP-T-22)
Stibnite Gold Project
Stibnite, ID
Data Sources: (SRK 2021)
Figure 4.9-23
Predicted Surface Water Chemistry Downstream of Yellow Pine Pit (YP-SR-4) Stibnite Gold Project

Data Sources: (SRK 2021)
Figure 4.9-24
Predicted Surface Water Chemistry Downstream of West End Pit (YP-T-6) Stibnite Gold Project

Data Sources: (SRK 2021)
Stibnite Gold Project
Stibnite, ID

Figure 4.9-25
Predicted Surface Water Chemistry Downstream of the Stibnite Mine Area (YP-SR-2)
Actual local mercury deposition rates from project emissions depend on the fractions of particulate versus gaseous mercury emissions. Particulate emissions generally deposit on the ground surface nearer to their source while gaseous emissions tend to deposit farther from the source or potentially become part of global atmospheric mercury burden.

Ratios of stream mercury loads to atmospheric mercury deposition rates have been reported in watersheds affected by gold and silver mining (Domagalski et al. 2016). The effects of aerial mercury deposition on stream loads are variable based on watershed area, mineralization present, land development, rainfall, and soil adsorption characteristics. In smaller watersheds hosting precious metal mining, total mercury stream loads are higher relative to the mass associated with aerial deposition with erodible sediments contributing relatively more to the stream load. Contributions from aerial deposition appear in stream loads over time as deposited mercury retained in soils is re-mobilized by local precipitation.

Therefore, aerial deposition would have a minor to moderate, long-term effect on particulate mercury loads in streams within the project area watershed, depending on the annual precipitation conditions.

**Methylmercury**

Predictive modeling indicates that mine facilities and water treatment would contribute dissolved mercury to surface waters primarily during the operating and early post-closure periods. These contributions are expected to increase the total mercury concentrations in surface waters compared to baseline conditions during those periods, while remaining below stream surface water standard values. Increases in total mercury may also result in increased methylmercury concentrations. There are many factors that affect methylmercury formation as methylation efficiency is influenced by pH, sulfate, total organic carbon, bacteria activity, and wetland abundance (Figure 4.9-26). An incremental increase in organic carbon content due to wastewater effluent (as described above) would yield an incremental increase in methylation potential.

A ratio method to estimate methylmercury concentrations from predicted total mercury concentrations was applied per the approach and data collection by Holloway et al. (2017) that showed methylmercury concentrations were up to two percent of total mercury concentrations in samples from Sugar Creek and the East Fork SFSR. For Meadow Creek, the East Fork SFSR, and Sugar Creek, predicted total mercury concentrations varied up to 5 ng/L compared to existing conditions which ranged between 2.5 ng/L and 159 ng/L. Application of the methylation ratio to 5 ng/L would result in an predicted increase of methylmercury concentrations up to 0.1 ng/L for these surface waters. If upstream total mercury concentrations in West End Creek persist to downstream areas of the creek due to its diversion around the West End pit area, application of the methylation ratio would indicate a potential increase of methylmercury concentrations up to 0.9 ng/L in that portion of West End Creek.

**Sediment**

Surface disturbance caused by the project would cause erosion of soil and overburden material. These eroded sediments could in turn affect surface water quality if the sediment is blown or washed into adjacent streams. Erosion and sedimentation effects on surface water quality are indicated primarily by changes in turbidity and total suspended solids in the receiving waters such as historical sediment effects on the SFSR. Predictions of these water quality indicators were not included in the surface water...
chemistry modeling. As such, changes in turbidity and total suspended solids have been qualitatively assessed using best available data and consideration of proposed management strategies for the SGP.

Proposed activities at the SGP would result in some erosion and sedimentation within Meadow Creek, Sugar Creek, and the East Fork SFSR during active surface material disturbance associated with mine construction, operations, reclamation, and closure, with the greatest potential for in-stream impacts occurring during times of higher overland flow. The effect to surface water quality as a result of sedimentation and erosion would be limited by applicable mitigation strategies and control techniques, by the limited duration of surface disturbing activities, and by the adaptability of the receiving environment (as indicated by the typically low baseline levels of total suspended solids and turbidity with seasonally variable spikes at times of higher overland flow).

Another SGP component that could increase stream sediment loads is draining the current Yellow Pine pit lake in preparation for mining. Perpetua would limit the potential for sedimentation impacts by following conditions in the Dewatering Practices section of their current Multi-Sector General Permit, or the Multi-Sector General Permit that is in place at the time (Brown and Caldwell 2020a). During mine construction, the Yellow Pine pit would be drained after the East Fork SFSR has been diverted around the pit lake, and the lake stage would be allowed to passively drop to the lake outlet elevation. The remaining water in the lake would then be withdrawn near the shoreline or from a floating intake managed to prevent disturbance of bottom sediments, thereby minimizing turbidity in the lake and in the discharged water. Water removed from the lake would be pumped downstream without treatment except for turbidity controls as needed. After the pit lake level is sufficiently below the outlet elevation, the nearly empty pit would be used for storm water management during pre-stripping of the pit highwalls. When complete drainage of the pit is necessary for mining, any water remaining in the pit bottom would be managed as contact water (i.e., either be used for construction purposes, transferred to the TSF for future use in ore processing, or contained in contact water ponds). By managing the Yellow Pine pit in this manner, excess sediment loading in the East Fork SFSR could effectively be prevented.

Surface water quality also could be impacted during construction, operations, closure, and reclamation by fugitive dust from vehicles and heavy equipment that settles into adjacent water bodies. Reduction of these potential impacts would be achieved through fugitive dust control at the SGP. In dry months, Perpetua would spray water on mine haul roads as necessary to mitigate dust emissions in compliance with state and Forest Service requirements.

The extent of sedimentation effects from erosion and fugitive dust would be concentrated at the SGP; however, due to the nature of sediment transport by streams, the geographic extent of the impact could extend farther downstream in the East Fork SFSR depending on site- and event-specific factors. The duration for traffic-related dust and erosion/sedimentation would last throughout the mine construction, operations, and post closure periods; however, the potential for these effects would be incrementally reduced during closure and reclamation due to reduced activity at the SGP and stabilization of disturbed areas.
Figure 4.9-26
Relationships between Surface Water Characteristics and Mercury Methylation

Stibnite Gold Project
Stibnite, ID
Data Sources: (USGS 2015)
Construction and use of roads can accelerate erosion and sediment delivery to streams and have been identified as the primary contributor of sediments to stream channels in managed watersheds (Trombulak and Frissell 2000). Roads are often chronic sources of sediment delivery from cut-slopes, ditch-lines, and running surfaces, and act as potential sites for accelerated mass movements (e.g., mud slides). Roads can also intercept subsurface flows, concentrate surface flows in ditch lines and through culverts and bridges, and act as direct conduits for sediment delivery to stream channels (Beschta 1978). The minimum road culvert size for mining projects in Idaho is 18-inch diameter (IDAPA 20.03.02.140.05.c).

The access roads used under the 2021 MMP would cross 71 different named and unnamed streams, as inventoried in Table 4.9-22.

**Table 4.9-22  Access Road Stream Crossings**

<table>
<thead>
<tr>
<th>Road/Component</th>
<th>Route/Access</th>
<th>Number of Crossings¹</th>
<th>Stream Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Lake Road (CR 10-579)</td>
<td>Johnson Creek Route &amp; Burntlog Route</td>
<td>16</td>
<td>Alpine Creek, Beaver Creek [combined biota/habitat bioassessments (COLD)], Big Creek, Deep Creek, Little Creek, Little Pearsol Creek, Pearsol Creek, SFSR [water temperature (SS), sedimentation (COLD)], Warm Lake Creek [water temperature (SS)], 7 Unnamed creeks</td>
</tr>
<tr>
<td>Johnson Creek Road (CR 10-413)</td>
<td>Johnson Creek Route</td>
<td>16</td>
<td>Bear Creek, Coffee Creek, Ditch Creek, Halfway Creek, Hanson Creek, Johnson Creek [water temperature (SS)], Lunch Creek, Moose Creek, Olson Creek, Park Creek, Pid Creek, Riordan Creek, Rustican Creek, Sheep Creek, Trapper Creek, Trout Creek</td>
</tr>
<tr>
<td>Road/Component</td>
<td>Route/Access</td>
<td>Number of Crossings&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Stream Names</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>McCall-Stibnite Road (CR 50-412)</td>
<td>Johnson Creek Route</td>
<td>11</td>
<td>3 Unnamed creeks&lt;br&gt;Double A Creek&lt;br&gt;East Fork SFSR [arsenic (DWS), arsenic (SCR)]&lt;br&gt;Profile Creek [water temperature (SS)]&lt;br&gt;Tamarack Creek&lt;br&gt;Salt Creek&lt;br&gt;Sugar Creek [mercury (COLD), arsenic (SCR)]&lt;br&gt;Vibika Creek&lt;br&gt;Whiskey Creek</td>
</tr>
<tr>
<td>Johnson Creek Road (CR 10-413)</td>
<td>Burntlog Route</td>
<td>21</td>
<td>Burntlog Creek&lt;br&gt;East Fork Burntlog Creek&lt;br&gt;East Fork SFSR&lt;br&gt;Johnson Creek&lt;br&gt;Landmark Creek [water temperature (SS)]&lt;br&gt;Peanut Creek&lt;br&gt;Rabbit Creek&lt;br&gt;Riordan Creek&lt;br&gt;Trapper Creek&lt;br&gt;Unnamed creeks (12)</td>
</tr>
<tr>
<td>Cabin Creek Groomed OSV Route (FR 467)</td>
<td>Cabin Creek Groomed OSV Route</td>
<td>7</td>
<td>Cabin Creek [water temperature (SS)]&lt;br&gt;Lunch Creek [water temperature (SS)]&lt;br&gt;Pid Creek [water temperature (SS)]&lt;br&gt;Park Creek [water temperature (SS)]&lt;br&gt;Sheep Creek [water temperature (SS)]&lt;br&gt;Trout Creek [water temperature (SS)]&lt;br&gt;Warm Lake Creek</td>
</tr>
</tbody>
</table>

Source: IDEQ 2020a
Any 303(d) listings in brackets
<sup>1</sup> The number of crossings listed for each road segment/route is for individual streams; in some cases, the road/route segment may cross one or more streams at multiple locations.
COLD = cold water aquatic life
DWS = domestic water supply
SCR = secondary contact recreation
SS = salmonid spawning
CR = County Road.
FR = National Forest System Road.

During the construction phase (approximately 2 to 3 years), the SGP would be accessed via Warm Lake Road (CR 10-579 and then the Johnson Creek Route (Johnson Creek Road [CR 10-413] and McCall-Stibnite [CR 50-412] Road), which would cross 43 of the 71 streams listed in Table 4.9-22. In addition to these stream crossings, the Johnson Creek Route is located in close proximity to streams (i.e., within 100 feet) for 6.5 miles or 18 percent of its 36-mile length. A total of 45 heavy vehicles and 20 light vehicles are anticipated on average per day (year-round) during construction, for an AADT total of 65 round trips utilizing the Johnson Creek Route.
During the Burntlog Route construction including bridge and culvert installations, the potential exists for increased runoff, erosion, and sedimentation as a result of localized vegetation removal and excavation of soil, rock, and sediment, which could result in increased sediment load in streams. Expected permit stipulations from the IDWR and IDEQ would ensure that streambank vegetation would be protected except where its removal is absolutely necessary; that new cut or fill slopes not protected with some form of riprap would be seeded and planted with native vegetation to prevent erosion; use of temporary erosion and sediment control BMPs associated with a stormwater pollution prevention plan; and that all activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations.

For stream crossings, Perpetua would replace existing, or install new, culverts or bridges at crossings along the Johnson Creek (CR 10-579), McCall-Stibnite (CR 50-412), and Burnt Log (FR 447) roads. Existing bridges and culverts along Warm Lake Road would remain. If not properly designed, constructed, and maintained, culverts and bridges could constrict natural streamflow leading to an increase in water velocity at the downstream end of the structure. This could lead to streambank and/or streambed erosion, and/or excessive erosion at the structure. Erosion of the streambed and/or banks could result in downstream sedimentation, a change in the morphology of the stream, and/or a change to the aquatic habitat. If a structure does not allow for adequate flow, water could pool excessively on the upstream side. As such, stream crossings associated with access roads would be designed to minimize potential impacts on surface water hydrology, water quality, and fish passage. The Forest Service would require stream crossings to be designed to accommodate a 100-year flood recurrence interval, unless site-specific analysis using calculated risk tools, or another method determines a more appropriate recurrence interval.

Utilities associated with the project (existing transmission line upgrades and structure work, right-of-way (ROW) clearing, new transmission line, and transmission line access roads) would cross 37 different streams, as inventoried in Table 4.9-23.

Of the 37 streams that would be crossed, 26 would be related to the upgrade of existing IPCo transmission lines, where the existing transmission line ROW crosses various streams. The existing transmission line would be upgraded from 69-kV to 138 kV service, which would require removing vegetation to widen the ROW corridor and replacing existing power poles with taller structures. Structure work would result in some ground disturbance at or near five streams. Use of the transmission line access road to facilitate year-round maintenance of the line also would result in disturbance at three stream crossings. Additionally, Perpetua would construct a new 8.5-mile, 138-kV transmission line from the Johnson Creek substation to a new substation at the SGP. The new transmission line corridor would require vegetation clearing along the ROW (intersecting three streams).
Table 4.9-23 Utility Stream Crossings

<table>
<thead>
<tr>
<th>Component</th>
<th>Number of Intersects&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Stream Names</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Alpine Creek</td>
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<tr>
<td></td>
<td></td>
<td>Bear Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beaver Creek [combined biota/habitat bioassessments (COLD)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Big Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boulder Creek [total phosphorus (COLD), sedimentation (COLD), flow regime alterations (COLD), temperature (COLD)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cabin Creek [water temperature (SS)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coffee Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deep Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ditch Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Halfway Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hanson Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hargrave Creek</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Hot Spring Creek [total phosphorus (COLD)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Johnson Creek [water temperature (SS)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lake Fork [low flow alterations (COLD)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Little Creek</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Moose Creek</td>
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<td></td>
<td></td>
<td>Olson Creek</td>
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<td>Pearsol Creek</td>
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<td></td>
<td></td>
<td>Rustican Creek</td>
</tr>
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<td></td>
<td></td>
<td>SFSR [water temperature (SS), sedimentation (COLD)]</td>
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<td></td>
<td></td>
<td>Trapper Creek</td>
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<tr>
<td></td>
<td></td>
<td>Trout Creek [water temperature (SS)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warm Lake Creek [water temperature (SS)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Willow Creek [total phosphorus (COLD)]</td>
</tr>
<tr>
<td>Structure Work for</td>
<td>5</td>
<td>Beaver Creek [combined biota/habitat bioassessments (COLD)]</td>
</tr>
<tr>
<td>Upgraded Transmission</td>
<td></td>
<td>Big Creek</td>
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<tr>
<td>Line</td>
<td></td>
<td>Hot Spring Creek [total phosphorus (COLD)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pearsol Creek</td>
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<tr>
<td></td>
<td></td>
<td>Willow Creek [total phosphorus (COLD)]</td>
</tr>
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<td>Transmission Line Access Road</td>
<td>3</td>
<td>Big Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cabin Creek [water temperature (SS)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unnamed Creek</td>
</tr>
<tr>
<td>New Transmission Line</td>
<td>3</td>
<td>No Man’s Creek</td>
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<td></td>
<td>Riordan Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unnamed Creek</td>
</tr>
</tbody>
</table>

Source: IDEQ 2020a
Any 303(d) or total maximum daily load listings in brackets
<sup>1</sup> The number of intersects listed for each component is for individual streams; in some cases, the utility-related component may intersect one or more streams at multiple locations.

COLD = cold water aquatic life
SS = salmonid spawning
During transmission line upgrades and new transmission line construction, the potential exists for increased runoff, erosion, and sedimentation as a result of vegetation removal within the ROW, and the localized excavation of soil, rock, and sediment for structure work and/or ROW access roads. Expected permit stipulations from IDWR and IDEQ would be similar to the examples provided above for access roads and would ensure the use of erosion and sediment control BMPs associated with a stormwater pollution prevention plan. All activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations. It is important to note that ROW vegetation clearing would be for the purpose of maintaining low height during operations and would not entail clearing and grubbing to bare soil. Consequently, the vegetation root structure within soils would be retained, reducing erosion concerns.

Based on the type of vegetation removal, the localized and discontinuous ground disturbance for structure footings and ROW access roads, and permit-related requirements including use of BMPs, the potential for transmission line-related erosion and sedimentation would be minimal (i.e., limited to periods of substantial overland flow). The duration of erosion/sedimentation potential would occur from the time new transmission line is constructed until it is reclaimed at the end of mine closure and reclamation (approximately 25 years). The upgrades to IPCo’s existing transmission line corridor would be permanent. Due to the nature of sediment transport by streams, the geographic extent of increased sedimentation could be hundreds of feet to miles, but it is expected that effects would be limited to within the subwatersheds of the analysis area.

During the mining and ore processing operations phase (approximately 15 years), SGP access would use the same existing Warm Lake Road (CR 10-579) and then the Burntlog Route (upgraded portions of Burnt Log Road [FR 477] and new road portions connecting to Meadow Creek Lookout Road [FR 51290]), which would cross 37 of the 71 streams (Table 4.9-22). The Burntlog Route alignment would be located within 100 feet of streams for approximately 1.69 miles or four percent of its 38.2-mile length. A total of 49 heavy vehicles and 19 light vehicles are anticipated on average per day (year-round) during operations, for an AADT total of 68 round trips utilizing the Burntlog Route. Additionally, public access along the Cabin Creek groomed OSV route during operations would include a total of 7 stream crossings.

For operation and use of the Burntlog Route, the potential for sedimentation would be reduced using standard erosion control measures, such as silt fencing, ditch checks, and other measures, which would be installed and maintained to minimize the potential for erosion and sedimentation. Numerous small (15- to 60-inch) drainage culverts would be installed along the Burntlog Route to reduce rutting and shunt water out of ditches and off the road prism, which would serve to reduce erosion from the road into streams. Perpetua would maintain a hardened road surface with gravel surfacing to promote an efficient and useable all-weather road (Perpetua 2021e, Transportation Management Plan).

Additionally, Perpetua would be required to comply with specific design requirements as part of the IDWR Stream Channel Alteration Permit, such as line of approach, minimum bridge clearance and minimum culvert size per length, and anchoring on steep slopes. Bridges and culverts would be maintained to allow proper drainage and limit sediment delivery to area streams.
Based on permit-related design requirements, use of BMPs, and required maintenance activities, the potential for access road-related erosion and sedimentation would be minimal (limited to periods of substantial overland flow, such as from very large rainfall events). The duration for this erosion/sedimentation potential would last throughout the entire period of use of the Burntlog Route (approximately 25 years) until it is reclaimed. Due to the nature of sediment transport by streams, the geographic extent of the impact could be hundreds of feet to miles, depending on many site- and event-specific factors, but it is expected that effects would be limited to within the subwatersheds of the analysis area.

During winter months, the Burntlog Route would be plowed for snow removal and sanded for winter driving safety. When practicable, snow would be removed down to the gravel, however, a snow-packed road surface could develop during the winter months. When snow-packed surfaces occur, sand/gravel would be applied to prevent vehicle slide offs. To protect surface water, snow removal standards or performance would include depositing snow and ice away from stream channels; maintaining appropriate snow floor depth to protect the roadway; clearly marking culverts and stream crossings; and no use of ice and snow removal chemicals.

It also should be noted that use of the Burntlog Route (in-lieu of the existing roads along the Johnson Creek Route) could lower sedimentation impacts by reducing the number of stream crossings (37 versus 43 crossings) and eliminating travel along and adjacent to Johnson Creek and the East Fork SFSR, as Johnson Creek and McCall-Stibnite roads follow and have multiple crossings of these two waterbodies.

During the closure and reclamation phase, traffic along the Burntlog Route would be reduced to a total of 13 heavy vehicles and 12 light vehicles on average per day (year-round), for an AADT total of 25 round trips.

Overall, based on identified maintenance activities, design features proposed by Perpetua, environmental protection measures required by the Forest Service, and permit stipulations from state and federal agencies, traffic-related dust and erosion/sedimentation would be within the normal range of properly maintained forest roads. The duration for traffic-related dust and erosion/sedimentation would last throughout the entire period of use of Burntlog Route (approximately 25 years) until it is successfully reclaimed; however, the potential for these effects would be incrementally reduced during closure and reclamation (when AADT would be reduced from 68 to 25 round trips). Due to the nature of airborne dust and sediment transport by streams, the geographic extent of the impact could be hundreds of feet to miles, depending on many site- and event-specific factors, but it is expected that effects would be limited to within the subwatersheds of the analysis area.

The effects of the SGP on sedimentation are expected to be moderate, long-term, and localized.

**Fuels and Hazardous Chemicals**

There is the potential for spills to occur along access roads as fuel and other materials are trucked to and from the SGP. If a spill were to occur at a stream crossing or near a stream, surface water could be impacted. Discussion of very low probability scenarios for a large release (tanker truck or concentrate truck rollover), and more probable scenarios involving small releases, is provided in Forest Service 2021k. Overall, regulatory and Forest Plan requirements required by the Forest Service, EDFs proposed
by Perpetua, and permit stipulations and regulatory requirements from state and federal agencies (including use of USDOT-certified containers and USDOT-registered transporters) would reduce the risk of spills and ensure that effective response is provided should a spill occur.

The combination of the proposed environmental protection practices and committed design measures would minimize the risk of accidental releases during the transportation, storage, management, and use of hazardous materials. Spills of fuels, oil or chemicals at the SGP would be retained in the secondary containment areas and cleaned up without release to the environment. At the SGP the most likely releases to the environment would be rare, small-scale spills of fuel or hydraulic oil from mobile mining equipment that would be quickly contained and cleaned up by SGP personnel leaving de minimis residuals. Spills from transportation of fuel, oil or chemicals along the proposed transportation routes beyond the SGLF (Burntlog or Johnson Creek roads) would be unlikely due to the receiving operations for chemicals at the SGLF and traffic controls exerted along the access roads for fuel to mitigate risks associated with travel on unpaved roads with steep grades. It would be more likely that spills of bulk liquids transported to the SGP (fuel, oil, acids) could be the result of accidents on the public highways. Perpetua is coordinating with local communities to address their potential needs for responding to accidents involving fuels and hazardous materials.

The overall environmental impacts from the reasonably foreseeable releases of hazardous materials under the 2021 MMP are considered to be localized, temporary, and minor to moderate depending on the type of material releases and the location of the spill.

**Surface Water Temperature**

Water temperature affects biological activity of aquatic organisms as well as the solubility of dissolved oxygen in stream waters. Thermal criteria describe thresholds and frequencies that aquatic species can tolerate without suffering adverse effects and are often specified for different seasons and life stages. The most commonly used metrics include the maximum weekly maximum temperature during the Summer and Fall seasons. This section describes the predicted temperatures resulting from construction, operation, and closure of the SGP. The companion SGP Fisheries and Aquatic Habitat Specialist Report (Forest Service 2022i) evaluates the impacts of these predicted stream temperatures on fish species (Section 4.12.2).

Under the 2021 MMP, changes to stream flow, groundwater-surface water interactions, and stream shading have the potential to affect stream temperatures. Surface water tends to warm when streams become shallower, receive smaller amounts of groundwater discharge (see Section 4.8.2), or receive more direct sunlight due to removal of riparian vegetation. Effluent from permitted discharges also can affect stream temperature. Predictions of future stream temperatures were generated by Brown and Caldwell (2021i) using a surface water temperature model. Forecasting future water temperatures over the post-closure period involves uncertainty associated with the performance and durability of implemented surface water restoration features (e.g., restored stream channels, Stibnite Lake feature), riparian planting, and closure water management plus broader climatic conditions. Model uncertainty and sensitivity is described further in Section 4.9.2.4, with approaches to mitigate forecasting and implementation uncertainty discussed in Section 4.9.3. This section describes the model results associated with the effective and durable implementation of the closure design and riparian plantings.
The temperature modeling scenario accounts for the following aspects of the SGP surface water management:

- Lining of some channels (preventing exchange with groundwater),
- Mining and vegetation removal (altering shade and topography),
- Dewatering pits (lowering of the groundwater table with subsequent reductions to stream flow rates in some reaches), and
- Permitted discharge of treated water or non-contact water to surface water.

This stream temperature description focuses on comparing predicted future temperatures to existing temperature conditions. Additional details regarding the modeling can be located in Brown and Caldwell 2021e, 2021i. The long-term post-closure results presented depend on the successful implementation of two reclamation features that contribute to controlling the temperature of stream flows in the project area:

- Establishment of 18-foot wide vegetation zones consisting of willow, spruce, and other riparian species that effectively shade stream flows in the restored and native stream channels in the mine area (Brown and Caldwell 2021i), and
- Development of the lined Stibnite Lake lacustrine feature above the cover of the Yellow Pine pit backfill to moderate maximum stream temperatures.

Improvements to stream shading were introduced into the stream restoration and closure programs in recognition of the significant affect solar radiation has on stream flow temperatures. Focused riparian re-vegetation efforts are supported by overall site re-vegetation and closure planning that reclaims disturbance in the vicinity of the stream channels. The relationship between shade addition or removal on stream temperatures has been observed in multiple locations in the northwest U.S. (Brown and Caldwell 2021i).

During operations, predicted maximum stream temperatures in the Yellow Pine pit area increase relative to existing conditions due in part to the removal of the pit lake there which acts to dampen diurnal variability of the water temperatures. Development of the Stibnite Lake feature to mimic the thermal characteristics of the existing pit lake would restore that dampening effect and promote the return of water temperatures toward existing conditions (Brown and Caldwell 2021i). The magnitude of stream flow temperature decreases related to shading varies with the recovery time of riparian vegetation and the effectiveness of its cover in inhibiting warming by solar radiation directly on the stream water (Section 4.9.3). Table 4.9-24 summarizes the predicted stream water temperatures based on designed effectiveness of riparian recovery. Temperature effects for riparian recovery less than design are described in Section 4.9.3.
### Table 4.9-24  Highest Simulated Temperatures (°C) across Mine Years for Surface Water Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Simulated Daily Temperature Statistic</th>
<th>No Action</th>
<th>Mine Year 6</th>
<th>Mine Year 12</th>
<th>Mine Year 18</th>
<th>Mine Year 27</th>
<th>Mine Year 52</th>
<th>Mine Year 112</th>
<th>Maximum Increase from No Action</th>
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<tbody>
<tr>
<td>Upper East Fork SFSR (above Meadow Creek)</td>
<td>Summer Max:</td>
<td>13.7</td>
<td>13.8</td>
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<td></td>
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<td>10.3</td>
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<td>14.6</td>
<td>14.6</td>
<td>24.5</td>
<td>19.9</td>
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<td>Fall Max:</td>
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<td>16.4</td>
<td>15.3</td>
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<td>10.6</td>
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<td>9.6</td>
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<td>9.7</td>
<td>9.6</td>
<td>9.6</td>
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<td>18.1</td>
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<tr>
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<td>12.9</td>
<td>21.7</td>
<td>19.1</td>
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<td>Maximum Increase from No Action</td>
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<td>Summer Max:</td>
<td>14.9</td>
<td>15.9</td>
<td>15.0</td>
<td>15.1</td>
<td>15.0</td>
<td>14.7</td>
<td>14.5</td>
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<td>10.1</td>
<td>9.8</td>
<td>9.7</td>
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</tr>
</tbody>
</table>

Source: Brown and Caldwell 2021i
°C = degree Celsius; Avg = average; EOY = end of year

Figures 4.9-27 and 4.9-28 summarize the predicted maximum weekly summer condition and maximum weekly fall condition for stream reaches of Meadow Creek and the East Fork SFSR. In the figures, predicted temperature statistics are compared to existing conditions and standards utilized by the Forest Service. Additional comparisons to Idaho standards and reference values can be located in Brown and Caldwell 2021i. The effects of these temperatures on fish and aquatic resources are included in the evaluation of those resources in Section 4.12.2 and the SGP Fish and Aquatic Habitat Specialist Report (Forest Service 2022i).

In Meadow Creek above the confluence with the East Fork SFSR, predicted water temperatures are cooler than existing conditions during the operating period. These cooler temperatures are attributable to the diversion of Meadow Creek around mine facilities in diversion channels and/or pipelines where the stream flow is less exposed to the warming influence of solar radiation. Upon closure, Meadow Creek would be routed into restored stream channels on top of the covered TSF. Initially during the post-closure period, the residence time of surface flow in the low-gradient sinuous restored stream channel would allow warming of temperatures above existing conditions and standards.

Following closure, predicted temperatures between the TSF and the confluence of Meadow Creek and EFMC (Blowout Creek) decrease as a net effect of increases in riparian shading plus recovery of groundwater discharge and surface water inflow. Under baseline conditions, this portion of Meadow Creek is a zone of groundwater discharge (Brown and Caldwell 2017a). Groundwater production by dewatering and industrial supply wells lowers water levels and groundwater discharge to surface water during operations. In addition, underdrain flow from the TSF is intercepted during operations. During closure, flows from cooler temperature groundwater discharge and underdrains increase in this area and riparian shading reduces the warming effect of solar radiation, resulting in lower predicted stream temperatures over time. Uncertainties in the predicted cooling effects of groundwater discharge and riparian shading are discussed further in Section 4.9.2.4.
Figure 4.9-27
Predicted Maximum Temperatures for the Maximum Weekly Summer Temperature in Meadow Creek and the EFSFSR Stibnite Gold Project Stibnite, ID
Data Sources: (Brown & Caldwell 2021b)
Figure 4.3-28 Predicted Maximum Weekly Fall Temperatures for the Maximum Temperature in Meadow Creek and the EFSFSR.

Data Sources: (Brown & Caldwell 2021b)
Predicted temperatures above the confluence of Meadow Creek and the East Fork SFSR are predicted to be comparable to the existing condition within approximately 10 years after reclamation and then continue to cool over time. On the Meadow Creek segment atop the reclaimed TSF, temperature reductions would occur more slowly remaining warmer than existing conditions after 100 years. Predicted timing of temperature reductions is subject to the uncertainty in the forecasting the implementation and durability of the stream restoration and riparian planting (Section 4.9.2.4).

In the East Fork SFSR, predicted water temperatures above the Yellow Pine pit area are cooler than existing conditions throughout the operations and closure periods as surface water diversions during operations and stream restoration plus riparian plantings reduce the solar radiation incident to surface flow. In the Yellow Pine pit area and downstream, maximum temperatures are higher than existing conditions while average temperatures are lower than existing conditions due to the removal of the pit lake’s moderating effect on maximum stream temperatures. In the post-closure period, development of the Stibnite Lake feature is predicted to reduce maximum temperatures to approximately the level of existing conditions with an associated increase in average temperatures to within one-half degree Celsius of existing conditions. Uncertainty in post-closure temperature predictions is discussed further in Section 4.9.2.4.

Several sizes of lake features ranging from 30 to 100 percent of the existing surface area and 40 to 100 percent of the existing volume of the Yellow Pine pit were evaluated. A design lake feature elongated along the direction of stream flow with the same depth of the Yellow Pine pit lake (i.e., approximately 30 feet) and 55 percent of its surface area was selected based on results from GLM modeling. Residence times for the existing Yellow Pine pit (2.6 to 3.6 days) and proposed Stibnite Lake feature (1.5 to 2.0 days) are both short. These short residence times allow for mixing of incoming stream flow with the approximately 16 million gallons of lake water to reduce diurnal fluctuations while increasing average temperatures (Brown and Caldwell 2021i). The reductions in maximum temperature and increases in average temperature were incorporated into the water temperature predictions (Table 4.9-24). Without the effects of the lacustrine feature, downstream maximum and average temperatures would be essentially the same as upstream maximum and average temperatures. These effects were incorporated into the impacts analyses on fisheries (Forest Service 2022i). Achievement of these predicted temperatures would depend on the effective and durable installation of the Stibnite Lake feature.

Durability of the Stibnite Lake feature would be partially dependent on effective control of sediment upstream of its location which could deposit and alter the restored stream and lacustrine features. As an initial step, the unstable slopes in lower Blowout Creek, which represent the largest single source of sediment in the subwatershed, would be stabilized during the construction period. During operations and closure, sediment would be managed under the facilities stormwater management plan followed by a reclamation program incorporating upland stabilization and revegetation measures. Restored stream channels designs include stabilizing features such as meadows and step pools which are low slope, unconfined reaches that would inhibit sediment transport downstream. The effectiveness of these measures would be assessed under the site EMMP to identify and address excessive and/or unexpected areas of erosion and sediment generation.

Uncertainties in the predicted cooling effects of the Lake Stibnite lacustrine feature are discussed further in Section 4.9.2.4.
West End Creek flows are predicted to warm during the operating period as ground disturbance and dewatering pumping reduce cooling influences of vegetation shading and groundwater discharge. Formation of the West End pit lake acts permanently raise temperatures compared to existing conditions in the stream segment immediately below that area which receives discharges of groundwater that has interacted with the pit lake. However, these increased temperatures in West End Creek have little influence on predicted temperatures in Sugar Creek between its confluence with West End Creek and above its confluence with the East Fork SFSR.

The limited disturbance associated with the GMS in the Fiddle Creek drainage associated has little effect on predicted Fiddle Creek temperatures above its confluence with the East Fork SFSR.

Compared to existing conditions, project operations are predicted to increase temperatures in West End Creek by up to 9°C and the East Fork SFSR below the Yellow Pine pit area by up to 3°C. Upon closure activities, Meadow Creek temperatures are predicted to increase by up to 10°C as the stream channel is restored atop the TSF while formation of the West End pit lake raises temperatures in West End Creek by approximately 4°C. With the exception of the West End Creek segment below the pit area, predicted temperatures return to existing conditions over a period of approximately 100 years as stream restoration and riparian plantings along with the moderating effect of the Stibnite Lake feature take effect (see also Section 4.9.3).

The consequences of increased stream temperatures are related to fish habitat and are evaluated in the Fish and Aquatic Habitat Specialist Report (Forest Service 2022i). This analysis is able to conclude that changes in stream water temperatures would be localized and long-term except for a segment in West End Creek where the effect would be permanent. During the operating period as the Yellow Pine pit is mined (i.e., Mine Year 6), summer and fall maximum temperatures in the East Fork SFSR below the Sugar Creek confluence are predicted to be warmer than existing conditions by up to one degree Celsius, while average summer and fall temperatures are predicted to be cooler than existing conditions. The higher maximum temperatures would raise maximum temperatures by less than one degree Celsius in the downstream reach of the East Fork SFSR until mixing with influent tributaries (Salt and Pepper Creek and Tamarack Creek) and groundwater discharge returned temperatures to existing conditions approximately two miles downstream from Sugar Creek. Aside from the operating period, predicted maximum and average summer and fall water temperatures in the East Fork SFSR below Sugar Creek are comparable to existing conditions and would also be comparable in the downstream reach. The implications of forecasting uncertainty of these affects are described in Section 4.9.2.4 with mitigation measures developed to address uncertainty described in Section 4.9.3. The impacts to fisheries are discussed in Section 4.12.2.

**Impaired Water bodies**

Of the 71 stream crossings for access roads, 14 are listed by IDEQ as impaired. Table 4.9-25 lists the Category 4 or 5 streams, the cause of impairment, and the beneficial use.
### Table 4.9-25  Access Road Stream Crossings of Impaired Waters

<table>
<thead>
<tr>
<th>Road</th>
<th>Stream Name</th>
<th>IDEQ Category</th>
<th>Cause of Impairment (Designated Beneficial Use)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burntlog Road &amp; Stibnite Road</td>
<td>East Fork SFSR</td>
<td>5</td>
<td>Arsenic (DWS) Arsenic (SCR)</td>
</tr>
<tr>
<td>Burntlog Road &amp; Johnson Creek Road</td>
<td>Johnson Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
<tr>
<td>Burntlog Road</td>
<td>Landmark Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
<tr>
<td>Cabin Creek Groomed OSV</td>
<td>Cabin Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
<tr>
<td>Johnson Creek Road &amp; Cabin Creek Groomed OSV</td>
<td>Lunch Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
<tr>
<td>Johnson Creek Road &amp; Cabin Creek Groomed OSV</td>
<td>Park Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
<tr>
<td>Johnson Creek Road &amp; Cabin Creek Groomed OSV</td>
<td>Pid Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
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<tr>
<td>Johnson Creek Road &amp; Cabin Creek Groomed OSV</td>
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<td>4A</td>
<td>Water temperature (SS)</td>
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<td>Trout Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
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<td>McCall-Stibnite Road</td>
<td>Profile Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
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<td>McCall-Stibnite Road</td>
<td>Sugar Creek</td>
<td>5</td>
<td>Mercury (COLD) Arsenic (SCR)</td>
</tr>
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<td>Warm Lake Road</td>
<td>Beaver Creek</td>
<td>5</td>
<td>Combined biota/habitat bioassessments (COLD)</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>SFSR</td>
<td>4A</td>
<td>Water temperature (SS) Sedimentation (COLD)</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>Warm Lake Creek</td>
<td>4A</td>
<td>Water temperature (SS)</td>
</tr>
</tbody>
</table>

Source: IDEQ 2020a

¹ DWS = domestic water supply; SCR = secondary contract recreation; SS = salmonid spawning; COLD = cold water aquatic life.

Most of the impaired waterbodies are listed for temperature, which is affected when riparian vegetation canopy shading is reduced from natural and anthropogenic impacts such as landslides or wildfires, road construction, and timber harvest. Access roads associated with the project would likely have a very small effect on temperature at stream crossings, where vegetation removal of shade-providing canopy would be localized, if required at all.

Access road crossings of the East Fork SFSR and Sugar Creek are unlikely to contribute arsenic or mercury loading because those road crossings are outside the mineralized areas targeted by the mine operations. Additionally, the Warm Lake Road crossings of the SFSR and Beaver Creek are existing paved crossings, where additional SGP-related traffic would not be expected to contribute to sedimentation at the SFSR Bridge or have effects to biota or habitat in Cascade. As such, access roads associated with the project would not be expected to affect overall progress toward beneficial use attainment of listed streams.
4.9.2.3 Johnson Creek Route Alternative

The water quality effects of the Johnson Creek Route Alternative and 2021 MMP are comparable with regard to contact water, water treatment, groundwater chemistry, surface water chemistry, stream temperature, and impaired water bodies. The change in site access does result in some differences in effects of sedimentation and fuels and hazardous chemicals.

Construction and operation of the Landmark Maintenance Facility and the SGLF would have the potential for increased runoff, erosion, sedimentation (as a result of vegetation removal and excavation of soil, rock, and sediment) and fuel and/or material discharge to nearby waterbodies during operations (if not properly stored or contained). However, design features proposed by Perpetua, regulatory and Forest Plan requirements required by the Forest Service, and permit stipulations from state and federal agencies (including BMPs, sanitary wastewater treatment, and SPCC Plan) would control runoff, erosion, sedimentation, and the potential for discharges. Therefore, effects of the Landmark Maintenance Facility and the SGLF were considered to be negligible to surface water quality analysis.

**Sediment**

The number of streams crossed along the Johnson Creek Route (43) would be fewer compared to the 2021 MMP as a result of the Burntlog Route not being constructed and used during operations. However, the Johnson Creek Route, adjacent to Johnson Creek and the East Fork SFSR, would be widened and upgraded under this alternative. Therefore, surface water quality impacts from erosion and sedimentation during access road construction could increase during the construction activities and would require implementation of sediment and erosion BMPs.

Use of the Johnson Creek Route for site access would avoid construction-related impacts from sedimentation at 21 different streams compared to the 2021 MMP. These streams include Burntlog Creek, East Fork Burntlog Creek, the East Fork SFSR, Johnson Creek, Landmark Creek, Peanut Creek, Rabbit Creek, Riordan Creek, Trapper Creek, and 12 unnamed waterbodies.

During mine construction, the number of daily vehicle trips to the SGP would be comparable between the alternatives. The number of daily vehicle trips also would be the same during mine operations and reclamation; however, all vehicle trips would traverse the Johnson Creek Route under this alternative, resulting in greater use of the Johnson Creek Route access roads, and more fugitive dust generation and greater wear and tear on the road surface. In addition, use of the Johnson Creek Route would require two additional years of construction. The resulting surface water quality impacts from erosion and sedimentation would therefore differ in location and extent compared to 2021 MMP but would be similar in magnitude because the number of vehicle trips to the SGP would remain the same.

Prevention of these types of impacts would be achieved through proper road design, construction, grade control, fugitive dust control and, in the winter months, snow removal and “sanding” using gravel and coarse sand with minimal fines to avert slippery conditions and reduce off-site sedimentation during the spring runoff season.

Overall, based on identified maintenance activities, design features proposed by Perpetua, regulatory and Forest Plan requirements required by the Forest Service, and permit stipulations from state and federal
agencies, traffic-related dust and erosion/sedimentation would be within the normal range of properly maintained NFS roads. The duration for traffic-related dust and erosion/sedimentation would last throughout the entire period of use of the Johnson Creek Route (approximately 40 years); however, the potential for these effects would be incrementally reduced during closure and reclamation (when AADT would be reduced). Due to the nature of airborne dust and sediment transport by streams, the geographic extent of the impact could be hundreds of feet to miles, depending on many site- and event-specific factors, but it is expected that effects would be limited to within the subwatersheds of the analysis area.

The effects of the Johnson Creek Route Alternative of sedimentation would be moderate, long-term, and localized.

**Fuels and Hazardous Chemicals**

The potential for surface water quality impacts from accidental fuel or chemical spills along the mine access roads would be comparable between the alternatives. However, all vehicle trips would traverse the Johnson Creek Route under this alternative, resulting in greater use of the Johnson Creek Route access roads. The potential location and extent of accidental spills would therefore differ compared to the 2021 MMP. The Johnson Creek Route is located in close proximity to streams (i.e., within 100 feet) for 6.5 miles or 18 percent of its approximately 36-mile length, so the potential for fuel and hazardous chemical spills impacting surface water quality is higher than for travel on the Burntlog Route which is within 100 feet of a stream for 1.69 miles or four percent of its length. Overall design features proposed by Perpetua, mitigation measures required by the Forest Service, and permit stipulations and regulatory requirements from state and federal agencies (including use of USDOT-certified containers and USDOT-registered transporters) would reduce the risk of spills and promote effective response should a spill occur.

The effects of spills associated with the Johnson Creek Route alternative on surface water would be major, temporary, and localized.

**4.9.2.4 Model Sensitivity and Uncertainty**

The model results discussed for groundwater and surface water are based on calibrated groundwater flow, stream and pit lake temperature, and geochemical equilibrium balance models (Brown and Caldwell 2018a, 2021a, 2021b, 2021g; SRK 2018b, 2021b).

In the site-wide water chemistry model, constituents and nodes where the relative percent difference between simulated and observed analyte concentrations was greater than a 20 percent threshold range for analytical variation (which included antimony and arsenic at several nodes), the discrepancy between simulated and observed concentrations was attributed to diffuse unquantified sources of constituent loading in the East Fork SFSR between Fiddle Creek and Sugar Creek, likely originating from several sources including mineralized bedrock outcrops and subsurface groundwater load inputs. To improve the model calibration, additional loading was added or subtracted from the simulation of the existing condition to represent the non-specific input to the river and achieve calibration for each constituent at each node. This is standard model calibration practice, and the additional loads that were added or subtracted to achieve calibration for the existing condition were carried forward to the simulation of the 2021 MMP used to generate future water quality predictions.
Despite the calibration of the water chemistry model, there is uncertainty inherent in the model predictions, as there would be for any model of this type. The technical adequacy review identified the following sources of model uncertainty and potentially non-conservative model assumptions:

- During the geochemical characterization program, three development rock samples were reported with paste pH less than 6. Although materials submitted for kinetic testing did not generate acidity during the duration of those tests (up to 197 weeks), actual long-term conditions for the proposed mine facilities could vary the rate of sulfide oxidation along with the leachate pH and/or leached analyte concentrations.
- First-flush chemistry for contact water coming from development rock was not considered relevant to surface water quality predictions (SRK 2018a). This is deemed a non-conservative assumption. First-flush releases from the development rock material could cause short-term increases in downstream concentrations above and beyond what is currently predicted by the model.
- Air temperature correction factors used to scale laboratory reaction rates to field conditions by the model could underestimate actual reaction rates and chemical releases from mined materials, and hence, surface water quality impacts.
- The surface water quality model predictions do not include mass loading inputs from permitted IPDES outfalls that would be required for the SGP. Additionally, mercury inputs from atmospheric deposition caused by the SGP have not been considered in the model. These additional loads were discussed qualitatively or semi-quantitatively in the analysis above but could modify future analyte concentrations compared to predicted values.
- Model-predicted concentrations generated by the SWWC Model are for the dissolved fraction only and may underpredict concentration levels for constituents such as mercury that have been shown to occur in particulate form.

The degree of potential predictive error from the above model assumptions and SGP design features was evaluated through sensitivity analysis simulations (SRK 2019, 2021b). Of the model uncertainties identified above, the sensitivity analysis mainly addressed the potential for acid-generation (via the NPR cutoff value used to classify PAG material) and the air temperature correction used to scale laboratory reaction rates to field conditions. Additional model runs also were conducted to evaluate the sensitivity of scaling assumptions related to the proportion of preferential flow paths and finer particle gradation in the TSF Buttress and pit backfills, as well as the pit wall fracture thickness and density. Findings from the SWWC model sensitivity analysis evaluation include the following (SRK 2019a, 2021b):

- Varying model input parameters for the sensitivity analysis had little effect on the mine operations model results.
- In one of the model sensitivity runs, the NPR cutoff for defining PAG material was increased to 2 (resulting in a greater percentage of pit wall rock and development rock lithology types being classified as PAG). The post-closure model results were not sensitive to increasing the NPR cutoff. The lack of model sensitivity to this parameter occurs because the mass loading rates for some constituents are lower in the PAG model source term input compared to some non-PAG units (SRK 2019). Thus, increasing the percentage of PAG rock in the TSF Buttress and pit lake models does not lead to higher predicted post-closure concentrations.
The model is not sensitive to varying the pit wall blast-damaged zone thickness.

The model is most sensitive to inputs that vary the bulk scaling factor of reactive rock, including the percentage of development rock fines, the percentage of rock contacted due to preferential flow paths through the TSF Embankment and Buttress, and increasing the reaction temperature.

When the bulk scaling factor of reactive rock is increased, concentrations of arsenic, antimony, sulfate, mercury, and aluminum are predicted to increase in contact water derived from the mined materials (SRK 2019). The constituents exceeding surface water standards in contact water were the same as those predicted for the 2021 MMP (SRK 2018a, 2021a), but the duration of contact water exceedances was affected in the model sensitivity runs.

Although not considered in the sensitivity analysis, mass loading from IPDES outfalls was examined in a water treatment scenario evaluated in the Water Quality Management Plan (Brown and Caldwell 2020a). Results of the water treatment simulation show that concentration reductions achieved by treating mine contact water greatly outweigh any loading contribution from the water treatment plant outfall (Figure 4.9-21).

Overall, the sensitivity analyses (SRK 2019, 2021b) and the water treatment evaluations (Brown and Caldwell 2020a, 2021f) address model uncertainty and non-conservative assumptions associated with acid-generation potential, IPDES outfalls, and air temperature correction factors. The sensitivity analysis and model treatment simulations show that changing the NPR cutoff for defining PAG material and adding the load from the water treatment plant outfall do not substantially alter predicted mine operational or post closure concentrations. However, increasing the reaction temperature in mined materials and pit walls was shown to produce higher post-closure arsenic concentrations in the pit lakes and downstream assessment nodes. Incorporation of first-flush chemistry in the model predictions would slightly increase predicted analyte concentrations. Effects of model uncertainty from simulating dissolved rather than total concentrations have not been evaluated, but total concentrations of analytes that appear in particulate form would be greater than the simulated dissolved concentrations.

For stream water temperature modeling, inherent sources of model uncertainty include:

- the actual effectiveness, timing, and sustainability of the shading effects of riparian plantings beside restored stream channels on reclaimed versus native soils and in an environment affected by weather events and wildfire which would be based on shading effects rather than typical reclamation revegetation goals (e.g., 70% of pre-existing cover),

- the actual effectiveness of the constructed and lined Stibnite Lake feature in achieving simulated surface water temperature reductions attributed to the unlined Yellow Pine pit lake. Introduction of the lined lacustrine feature atop the lined and covered backfill in the Yellow Pine pit would modify the volume of diffuse subsurface groundwater inflow. The lined Stibnite Lake feature would receive inflow from the cover material in contrast to the existing groundwater inflow from native bedrock into the Yellow Pine pit Lake. Depending on the hydraulic properties of the cover material compared to the native bedrock, the volume of groundwater inflow to the lake could differ from existing inflow rates with associated implications for resulting lake water temperature. The current temperature model does not incorporate any potential cooling effects from subsurface inflow into the Stibnite Lake feature,
• spatial variability associated with the reduction and recovery of groundwater levels and groundwater discharge to surface water, and
• potential broader effects of climate change on air temperature, meteoric precipitation, weather events, wildfire, and plant growth.

These sources of uncertainty relate largely to spatially and temporally variable implementation success and sustainability of closure activities which are difficult simulate directly with a temperature model. Qualitatively however, insufficiently effective closure activities and/or adverse changes in broader climate conditions could result in higher than predicted stream temperatures.

4.9.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. The mitigation measures described below are in addition to the Forest Service requirements and EDFs accounted for in the preceding impact analysis.

Issue: Long-term performance of stream temperature reduction measures may have the potential to not fully achieve the forecasted stream temperature results. For example, the restored stream channel across the closed TSF may experience different consolidation, hydrologic, and/or re-vegetation performance compared to model forecasts that would affect its viability for reducing stream temperature as well as maintaining a physically and chemically stable closure for the TSF.

Mitigation Measure - Contingent Stream Temperature Reduction Measures: Due to inherent limitations in modeling and forecasting stream flow temperatures over a multi-decade period, effectiveness of the actual performance of TSF consolidation, stream channel restoration, riparian plantings, and other temperature reduction measures implemented may differ from forecast. At less than full design efficiency, predicted stream temperatures remain elevated in the TSF area and near existing conditions in downstream areas without realizing the benefit of the restored stream channel over the TSF on reducing stream temperatures below the existing condition (Figure 4.9-29).

Without this temperature reduction, stream temperatures downstream of the Yellow Pine pit area could also be greater than existing conditions.

Ditches and pipelines utilized to divert water around the TSF during operations are expected to result in cooler water temperatures downstream than existing conditions. In addition, these diversions would not be affected by TSF consolidation or implementation of stream channel restoration. Therefore, these surface flow diversions would continue to be utilized and not be removed/reclaimed until:

1. TSF consolidation appropriate for stream channel restoration could be verified via consolidation monitoring and remodeling for the as-built tailings facility,
2. Stream restoration design and implementation could be re-assessed prior to construction by resurveying the as-built and partially consolidated TSF surface to determine whether design stream gradients could be achieved or whether the stream channel design would need adjustment to accommodate the gradients of post-consolidation TSF surface, and
Figure 4.9-29
Sensitivity Analysis of Predicted MWMT Summer Temperature in Meadow Creek and the EFSFSR

Stibnite Gold Project
Stibnite, ID

Data Sources: (Brown & Caldwell 2022)
3. Achievement of design shading effects of riparian plants on stream temperatures could be re-assessed prior to construction by measuring the success of establishing riparian plantings at locations outside the TSF footprint (e.g., Hangar Flats pit diversion corridor, TSF Buttress, across the Yellow Pine pit backfill or others) or a TSF-analogous test plot location utilizing the design cover materials and thicknesses.

Operational period maintenance practices for the diversions would remain into effect into the closure and post-closure period to prevent sedimentation and other factors from impairing the effective use of the diversions. Upon verification of the items above with any associated design adjustments, stream water temperature monitoring data in the constructed restored stream channel would be collected to confirm the performance of the temperature reduction measures. In an event where monitoring data indicated that acceptable stream temperatures would not be attained, the ditch and pipeline diversions would be re-commissioned and utilized to convey surface flows until an effective planting design would be developed and implemented.

**Effectiveness:** This monitoring and mitigation measure would be effective in reducing stream temperatures to predicted levels. However, it could delay the reclamation of surface water diversion ditches and pipelines for a period of several years, until stream temperature reductions could be achieved by shading, channel reconfiguration, or other means. This could delay the placement of up to 33,000 BCY of growth media. Any extended usage of the operational period diversion may also affect the implementation of approximately 121 acres of riparian planting and wetlands restoration plus the establishment of potential fish habitat on the reclaimed TSF area. However, the stream temperatures could be more conducive to fish occupancy in reaches of the East Fork SFSR in the mine site area (see Section 4.12 for additional details).

**Issue:** As with any predictive model, limitations to long-term water chemistry modeling may result in underestimation of the nature and/or extent of surface water and groundwater quality impacts.

**Monitoring Measure - Water Resource Monitoring Plan Implementation:** Because construction, operation, and closure of the proposed Project has potential to impact surface or groundwater resources, a focused Water Resources Monitoring Plan for the approved project would be developed by Perpetua. As the mine owner/operator, Perpetua would be responsible for the implementation of the Water Resources Monitoring Plan for any approved action incorporating the confirmation of predicted surface water and groundwater chemistry plus surface water temperature. The plan would include mined development rock and ore, surface water, groundwater, and meteorological monitoring requirements. Monitoring results would be provided to the Forest Service on a quarterly basis and summarized in an annual report. Perpetua would be responsible for continued monitoring and reporting of surface and groundwater chemistry and temperature prior to, during, and after operations for a period of time in the post-reclamation period. The plan would be reviewed and approved by the Forest Service and implemented prior to the commencement of mining. State authorizations may also have monitoring requirements and these requirements along with monitoring already conducted or proposed could be applied to satisfy the needs of this mitigation measure.

**Effectiveness:** This monitoring measure would provide for identification of potential impacts to groundwater and surface water resources as a result of mine-related water management activities.
Implementation of this monitoring measure in conjunction with associated mitigation measures is anticipated to mitigate any impacts that deviate outside model uncertainty to surface water and groundwater resources resulting from mine-related water management during the construction, mining, and closure periods. If such deviation is observed, actions may consist of additional investigation and evaluation, including additional monitoring as necessary, to determine effective management practices and prevent adverse impacts.

**Issue:** Despite the best efforts at calibration and validation predictive modeling of groundwater and surface water chemistry and temperature entails uncertainty and future field conditions may vary from model predictions.

**Monitoring Measure - Updated Geochemical and Temperature Modeling:** Geochemical modeling and/or temperature modeling would be updated as necessary (at the request of the Forest Service) if monitoring results obtained from the Water Resources Monitoring Plan or other data collection indicate a change in water quality conditions that would significantly influence prediction and recognition of potential mine impacts. The Forest Service’s review of quarterly and annual monitoring results compared to predicted conditions would provide early warning of potentially unanticipated, undesirable impacts to water resources to allow for implementation of appropriate mitigation measures. Implementation of these mitigation measures would reduce or eliminate potential impacts to water quality.

**Effectiveness:** Implementation of this monitoring measure is expected to be effective in sustaining predictive models as usable evaluation tools that reflect site conditions and monitoring data for the purpose of predicting impacts and developing effective management practices.

### 4.9.4 Irreversible and Irretrievable Commitments of Public Resources

#### 4.9.4.1 No Action Alternative

Under the No Action Alternative, there would be no open pit mining or removal of legacy waste material at the mine site. Consequently, no changes would occur to current geochemical, surface water, or groundwater conditions in the analysis area, and no change to the current commitment of these resources would occur. Therefore, there would be no irreversible or irretrievable commitment of geochemical, surface water, or groundwater resources.

#### 4.9.4.2 Action Alternatives

With respect to geochemistry, gold, silver, and antimony are non-renewable resources that would be mined from ore deposits and then milled to remove the metals, constituting an irreversible commitment of mineral/geochemical resources. Other metals and elements present in the Yellow Pine, Hangar Flats, and West End Deposits that are not currently economically viable also would be removed from their native geologic setting and may not be retrievable in the future.

Additionally, under the 2021 MMP, the geochemistry of the mine site would be altered by removing and disposing of legacy mine waste, and by introducing new sources of waste material to the natural environment, including tailings, development rock, and exposed leachable material in the pit walls. The geochemical changes brought about by mining would therefore be irretrievable, because in many cases
the geochemical impacts to groundwater chemistry and the West End pit lake are predicted to persist into the post-closure period.

No irreversible surface water quality impacts would occur because surface water is a renewable resource. However, surface water quality changes caused by the 2021 MMP would effectively be irretrievable because uses could be impaired until impacts were abated by EDFs and/or mitigation measures.

Groundwater at the mine site also can be considered a renewable resource because it is adequately replenished by natural recharge, preventing the occurrence of irreversible groundwater impacts except beneath mine facilities such as the TSF, the TSF Buttress, Hangar Flats pit backfill and Yellow Pine pit backfill where reductions in recharge caused by cover systems would permanently lower groundwater levels. Formation of the West End pit lake would also permanently lower groundwater levels in its vicinity. Irretrievable impacts would occur when concentration changes in the mine site groundwater are predicted to persist throughout the entire 100-year post closure period. This type of long-term concentration change would be considered an irretrievable impact because it may limit the productivity of groundwater for designated uses.

Under the Johnson Creek Route Alternative, irreversible geochemical impacts would be the same as for the 2021 MMP. Irretrievable geochemical and water quality impacts also would be the same.

4.9.5 Short-term Uses versus Long-term Productivity

4.9.5.1 No Action Alternative

Under the No Action Alternative, there would be no open pit mining or removal of legacy waste material at the SGP. Consequently, no short-term use would occur that would affect geochemical, surface water, or groundwater resources, and no change in long-term productivity would occur.

4.9.5.2 Action Alternatives

Mining by its nature is a short-term land use that typically results in long-term impacts by permanently altering the natural environment. For the 2021 MMP, mining-related changes include open pit mining and disposition of mine waste material in the TSF, the TSF Buttress, and pit backfills. The long-term impacts associated with these features have been quantified through modeling as discussed above, and would be offset to a degree by removal, reprocessing, and disposal of the SODA and Bradley tailings material currently present in Meadow Creek valley. However, there are still several constituents that are predicted to be elevated above existing conditions and/or applicable water quality standards in surface water or groundwater throughout the entire 100-year model-simulated post closure period, attributable to a combination of existing conditions and mine-impacted waters. Due to these predicted water quality changes, water treatment of several mine-related discharges would be required to maintain the long-term productivity of water resources both within and downstream of the mine area until facility seepage collection plus cover and liner systems effectively abate discharge of mine-impacted water to the environment (over approximately 40 years).
Under the Johnson Creek Route Alternative, long-term losses of groundwater and surface water productivity would be the same as the 2021 MMP except that transportation-related impacts to surface waters in the Johnson Creek drainage could be greater in nature and/or extent.

4.10 Vegetation

4.10.1 Impact Definitions and Effects Analysis Indicators and Methodology

The analysis of effects on vegetation includes the following issues and indicators:

**Issue**: The SGP would impact forested PVGs within Forest Service-administered land and could impact the ability of these areas to reach desired conditions.

**Indicators**:

- Acres of SGP disturbance to previously undisturbed forest PVGs within Forest Service-administered land.

**Issue**: The SGP would impact non-forested areas (i.e., those that are identified through PVG mapping as not being successional to forests) within Forest Service-administered land and could impact the ability of these areas to reach desired conditions.

**Indicators**:

- Acres of SGP disturbance to previously undisturbed non-forested areas within Forest Service-administered land.

**Issue**: The SGP would impact vegetation outside the boundaries of the Forests.

**Indicators**:

- Acres of SGP disturbance in previously undisturbed LANDFIRE existing vegetation types outside Forest Service boundaries.

**Issue**: The SGP would remove whitebark pine individuals, and habitat conversion associated with the SGP would impact seed production, dispersal, and establishment of this species.

**Indicators**:

- Number of acres of whitebark pine occupied habitat impacted by the SGP.
- Estimated number of mature whitebark pine trees to be cut during SGP construction.

**Issue**: The SGP would impact known occurrences of Regional and Forest-specific designated sensitive and forest watch plant species.
Indicators:

- Presence of known occurrences of sensitive or forest watch plant species or occupied habitat within 300 feet of the SGP disturbance area.

Issue: The SGP would result in a direct loss of modeled potential habitat for Regional and Forest-specific designated sensitive and forest watch plant species.

Indicators:

- Acres of modeled potential habitat for Regional and Forest-specific designated sensitive and forest watch plant species disturbed by the SGP.

Issue: SGP actions would result in increased potential for non-native plant establishment and spread.

Indicator:

- Total acres of land disturbed by the SGP.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.10.2 Direct and Indirect Effects

4.10.2.1 No Action Alternative

Under the No Action Alternative, the mining, ore processing, and related activities under the two action alternatives would not take place and there would be no direct or indirect effects to vegetation and no changes to current conditions for vegetation in the analysis area from the SGP. However, existing and approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue and Perpetua would not be precluded from subsequently submitting another plan of operations pursuant to the Mining Law.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015c). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the mine site. These exploration and subsequent reclamation activities would have only a small direct effect on vegetation resources, as the disturbance footprint associated with the Golden Meadows EA is limited to the temporary access roads to pads and the exploration drilling holes.

Perpetua would be required to continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using
standard reclamation practices, and monitoring to ensure that sediment and stormwater BMPs are in place and effective so that impacts to vegetation are avoided or minimized.

### 4.10.2.2 2021 MMP

**Impacts to Forested Vegetation Communities within Forest Service-Managed Land**

Anticipated acreages of direct impacts of vegetation clearing to previously undisturbed forested PVGs within Forest Service-managed lands under the 2021 MMP are presented in Table 4.10-1. These areas would not maintain or move towards desired conditions into the foreseeable future. Most impacts to PVGs under the 2021 MMP would be related to disturbance activities at the Operations Area Boundary and would occur in the Warm, Dry Subalpine Fir (PVG 7) and Persistent Lodgepole Pine (PVG 10) types, which are the most extensive PVGs in the analysis area. This would result primarily in localized, long-term and permanent, moderate impacts to forested vegetation communities within Forest Service-managed land, depending on the SGP component and specific PVG type impacted.

<table>
<thead>
<tr>
<th>PVG</th>
<th>Mine Site</th>
<th>Off-site Facilities</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVG 1 – Dry Ponderosa Pine/ Xeric Douglas-fir</td>
<td>-</td>
<td>-</td>
<td>1.3</td>
<td>1.0</td>
<td>0.5</td>
<td>2.8</td>
</tr>
<tr>
<td>PVG 2 – Warm, Dry Douglas-fir/ Moist Ponderosa Pine</td>
<td>0.5</td>
<td>-</td>
<td>31.9</td>
<td>155.0</td>
<td>52.8</td>
<td>240.1</td>
</tr>
<tr>
<td>PVG 3 – Cool, Moist Douglas-fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7.9</td>
<td>2.7</td>
<td>10.6</td>
</tr>
<tr>
<td>PVG 4 – Cool, Dry Douglas-fir</td>
<td>4.9</td>
<td>-</td>
<td>29.1</td>
<td>109.4</td>
<td>38.8</td>
<td>182.2</td>
</tr>
<tr>
<td>PVG 5 – Dry Grand Fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>67.6</td>
<td>22.6</td>
<td>90.1</td>
</tr>
<tr>
<td>PVG 6 – Moist Grand Fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41.5</td>
<td>14.6</td>
<td>56.1</td>
</tr>
<tr>
<td>PVG 7 – Warm, Dry Subalpine Fir</td>
<td>498.3</td>
<td>1.6</td>
<td>131.9</td>
<td>81.5</td>
<td>28.5</td>
<td>741.8</td>
</tr>
<tr>
<td>PVG 8 – Cool Moist Subalpine Fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PVG 9 – Hydric Subalpine Fir</td>
<td>3.8</td>
<td>-</td>
<td>12.3</td>
<td>11.7</td>
<td>4.4</td>
<td>32.2</td>
</tr>
<tr>
<td>PVG 10 – Persistent Lodgepole Pine</td>
<td>251.0</td>
<td>2.9</td>
<td>199.4</td>
<td>172.1</td>
<td>53.8</td>
<td>679.1</td>
</tr>
<tr>
<td>PVG 11 – High Elevation Subalpine Fir (with Whitebark Pine)</td>
<td>-</td>
<td>-</td>
<td>21.0</td>
<td>19.6</td>
<td>7.4</td>
<td>48.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>758.4</strong></td>
<td><strong>4.5</strong></td>
<td><strong>427.0</strong></td>
<td><strong>667.2</strong></td>
<td><strong>226.1</strong></td>
<td><strong>2,083.2</strong></td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017a), omitting areas of previous mine site disturbance (Perpetua 2021a).

1Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.

2Due to rounding, numbers presented in this table may not sum precisely to the totals provided.
Impacts to Non-Forested Vegetation Communities within Forest Service-Managed Land

Anticipated acreages of direct impacts of vegetation clearing to previously undisturbed areas identified as not successional to forested PVGs within Forest Service-managed lands under the 2021 MMP are presented in Table 4.10-2. These areas would not maintain or move towards desired conditions into the foreseeable future. Most impacts to these areas would be related to disturbance activities at the mine site and would occur in the Douglas-fir and Lodgepole Pine existing vegetation types. This would result primarily in localized, short-term, long-term, and permanent, moderate impacts to non-forested vegetation communities within Forest Service-managed land, depending on the SGP component and specific vegetation type impacted.

Table 4.10-2  Acres of Disturbance to Areas Identified as not Successional to Forested PVGs under the 2021 MMP

<table>
<thead>
<tr>
<th>Existing Vegetation Type</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Off-site Facilities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td>Burned Forest Shrublands</td>
<td>-</td>
<td>1.8</td>
<td>3.5</td>
<td>1.3</td>
<td>-</td>
<td>6.6</td>
</tr>
<tr>
<td>Burned Herblands</td>
<td>5.4</td>
<td>2.8</td>
<td>7.7</td>
<td>2.5</td>
<td>-</td>
<td>18.4</td>
</tr>
<tr>
<td>Burned Sparse Vegetation</td>
<td>0.3</td>
<td>5.5</td>
<td>1.1</td>
<td>0.6</td>
<td>-</td>
<td>7.2</td>
</tr>
<tr>
<td>Developed</td>
<td>8.9</td>
<td>0.2</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
<td>9.3</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>6.8</td>
<td>12.5</td>
<td>10.8</td>
<td>3.7</td>
<td>-</td>
<td>33.7</td>
</tr>
<tr>
<td>Douglas-fir/Lodgepole Pine</td>
<td>5.9</td>
<td>0.1</td>
<td>0.7</td>
<td>0.2</td>
<td>-</td>
<td>6.1</td>
</tr>
<tr>
<td>Douglas-fir/Ponderosa Pine</td>
<td></td>
<td>0.9</td>
<td>0.7</td>
<td>0.2</td>
<td>-</td>
<td>1.8</td>
</tr>
<tr>
<td>Engelmann’s Spruce</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>0.2</td>
<td>-</td>
<td>0.7</td>
</tr>
<tr>
<td>Forblands</td>
<td>-</td>
<td>4.7</td>
<td>2.0</td>
<td>0.8</td>
<td>-</td>
<td>7.5</td>
</tr>
<tr>
<td>Forest Shrublands</td>
<td>-</td>
<td>1.2</td>
<td>4.0</td>
<td>1.2</td>
<td>-</td>
<td>5.2</td>
</tr>
<tr>
<td>Grasslands</td>
<td>2.0</td>
<td>0.2</td>
<td>1.5</td>
<td>0.5</td>
<td>-</td>
<td>4.1</td>
</tr>
<tr>
<td>Lodgepole Pine</td>
<td>10.4</td>
<td>7.2</td>
<td>5.9</td>
<td>2.7</td>
<td>-</td>
<td>26.2</td>
</tr>
<tr>
<td>Mountain Big Sagebrush</td>
<td>-</td>
<td>0.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>-</td>
<td>0.2</td>
<td>4.5</td>
<td>1.7</td>
<td>-</td>
<td>6.4</td>
</tr>
<tr>
<td>Riparian Herblands</td>
<td>1.9</td>
<td>0.4</td>
<td>1.3</td>
<td>0.4</td>
<td>-</td>
<td>4.1</td>
</tr>
<tr>
<td>Riparian Shrublands/ Deciduous Forests</td>
<td>1.7</td>
<td>0.3</td>
<td>4.7</td>
<td>2.1</td>
<td>-</td>
<td>8.9</td>
</tr>
<tr>
<td>Sparse Vegetation</td>
<td>7.2</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
<td>-</td>
<td>7.7</td>
</tr>
<tr>
<td>Subalpine Fir</td>
<td>-</td>
<td>5.0</td>
<td>1.0</td>
<td>0.4</td>
<td>-</td>
<td>6.4</td>
</tr>
<tr>
<td>Water</td>
<td>-</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Existing Vegetation Type</td>
<td>Mine Site</td>
<td>Access Roads</td>
<td>Utilities</td>
<td>Tall Tree Clearing</td>
<td>Off-site Facilities</td>
<td>Total</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------</td>
<td>--------------</td>
<td>-----------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Whitebark Pine</td>
<td>-</td>
<td>0.1</td>
<td>0.1</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td>Total</td>
<td>50.3</td>
<td>42.5</td>
<td>50.0</td>
<td>18.7</td>
<td>-</td>
<td>161.5</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017a) and VCMQI mapping (Forest Service 2016b, 2021d), omitting areas of previous mine site disturbance (Perpetua 2021a).

1PVG mapping and existing vegetation mapping are performed using different processes and different objectives. As such, forest existing vegetation types may occur within areas identified as not successional to forests in PVG mapping, and alternatively, non-forest existing vegetation types may occur in areas identified as successional to forests in PVG mapping.

2Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.

3Due to rounding, numbers presented in this table may not sum precisely to the totals provided.

Impacts to Vegetation Communities Outside Forest Service-Managed Land

Anticipated acreages of vegetation clearing in vegetation communities outside Forest Service-managed lands under the 2021 MMP are presented in Table 4.10-3. In addition to the direct impact of vegetation clearing, these areas would experience the types of indirect impacts described below. This would result primarily in localized, short-term, long-term, and permanent, moderate impacts to vegetation communities outside Forest Service-managed land, depending on the SGP component and specific vegetation type impacted.

Table 4.10.3 Acres of Disturbance to Vegetated Acres Outside Forest Service-Managed Lands under the 2021 MMP

<table>
<thead>
<tr>
<th>LANDFIRE Vegetation Class Name</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Off-site Facilities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Western North American Temperate Ruderal Grassland</td>
<td>33.7</td>
<td>17.9</td>
<td>-</td>
<td>51.6</td>
</tr>
<tr>
<td>Interior Western North American Temperate Ruderal Shrubland</td>
<td>6.1</td>
<td>2.8</td>
<td>-</td>
<td>9.0</td>
</tr>
<tr>
<td>Inter-Mountain Basins Montane Sagebrush Steppe</td>
<td>2.3</td>
<td>1.1</td>
<td>-</td>
<td>3.4</td>
</tr>
<tr>
<td>Middle Rocky Mountain Montane Douglas-fir Forest and Woodland</td>
<td>0.6</td>
<td>0.5</td>
<td>-</td>
<td>1.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest</td>
<td>31.2</td>
<td>14.7</td>
<td>10.9</td>
<td>56.9</td>
</tr>
<tr>
<td>Northern Rocky Mountain Foothill Conifer Wooded Steppe</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Lower Montane Riparian Shrubland</td>
<td>5.5</td>
<td>2.4</td>
<td>0.3</td>
<td>8.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Lower Montane Riparian Woodland</td>
<td>6.3</td>
<td>3.0</td>
<td>5.9</td>
<td>15.2</td>
</tr>
<tr>
<td>Northern Rocky Mountain Mesic Montane Mixed Conifer Forest</td>
<td>2.6</td>
<td>1.1</td>
<td>0.7</td>
<td>4.4</td>
</tr>
<tr>
<td>LANDFIRE Vegetation Class Name</td>
<td>Utilities</td>
<td>Tall Tree Clearing&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Off-site Facilities</td>
<td>Total</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Northern Rocky Mountain Montane-Foothill Deciduous Shrubland</td>
<td>7.8</td>
<td>2.3</td>
<td>-</td>
<td>10.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Ponderosa Pine Woodland and Savanna</td>
<td>16.6</td>
<td>5.6</td>
<td>0.9</td>
<td>23.0</td>
</tr>
<tr>
<td>Northern Rocky Mountain Subalpine Deciduous Shrubland</td>
<td>3.5</td>
<td>1.0</td>
<td>-</td>
<td>4.5</td>
</tr>
<tr>
<td>Rocky Mountain Alpine-Montane Wet Meadow</td>
<td>38.3</td>
<td>20.1</td>
<td>0.0</td>
<td>58.5</td>
</tr>
<tr>
<td>Rocky Mountain Cliff Canyon and Massive Bedrock</td>
<td>1.7</td>
<td>0.4</td>
<td>0.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Rocky Mountain Lodgepole Pine Forest</td>
<td>16.5</td>
<td>6.1</td>
<td>2.9</td>
<td>25.5</td>
</tr>
<tr>
<td>Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>Rocky Mountain Subalpine-Montane Mesic Meadow</td>
<td>1.7</td>
<td>0.7</td>
<td>-</td>
<td>2.4</td>
</tr>
<tr>
<td>Open Water</td>
<td>6.6</td>
<td>3.3</td>
<td>-</td>
<td>9.9</td>
</tr>
<tr>
<td>Agricultural, Developed</td>
<td>111.4</td>
<td>68.3</td>
<td>2.5</td>
<td>216.0</td>
</tr>
<tr>
<td><strong>TOTALS&lt;sup&gt;2&lt;/sup&gt;</strong></td>
<td><strong>292.4</strong></td>
<td><strong>133.5</strong></td>
<td><strong>24.3</strong></td>
<td><strong>450.2</strong></td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts were calculated by overlaying SGP components outside Forest Service boundaries with LANDFIRE data (USGS 2016a).

<sup>1</sup>Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.

<sup>2</sup>Due to rounding, numbers presented in this table may not sum precisely to the totals provided.

**Impacts to Whitebark Pine**

Based on the results of the species-specific field surveys conducted for the SGP in 2019 (Tetra Tech 2020b), the 2021 MMP would impact approximately 259.4 acres of occupied whitebark pine habitat and would remove an estimated 1,236 individual trees, 23 of which would be mature, cone-bearing individuals. This would result primarily in localized, long-term and permanent, moderate impacts to the whitebark pine.

Detailed calculations of impacts to whitebark pine occupied habitat and individual trees are reported in the SGP Vegetation Specialist Report Appendix F (Forest Service 2022g). The Forest Service has preliminarily determined that the 2021 MMP would impact whitebark pine but would not jeopardize the continued existence of this species.

**Impacts to Known Locations of Sensitive and Forest Watch Species**

Construction of the 2021 MMP would impact several known occurrences of sensitive and forest watch plant species as described in the following subsections.
Bent-flowered Milkvetch (*Astragalus vexilliflexus* var. *vexilliflexus*)

Several subpopulations of a single occurrence of bent-flowered milkvetech, a PNF forest watch species, occur to the east of the SGP (IFWIS 2017; Mancuso 2016). One of the bent-flowered milkvetech subpopulations (the Cinnabar Peak subpopulation) extends from approximately one-quarter mile to approximately 300 feet upslope of the West End Creek diversion (Mancuso 2016).

The 2021 MMP could impact the Cinnabar Peak subpopulation due to its proximity to the West End Creek diversion. The most likely impact of the SGP on this subpopulation would be dust associated with construction of the West End Creek diversion, which could travel upslope and impact this subpopulation or its pollinators. Impacts of dust on the Cinnabar Peak subpopulation could range from mild metabolic inhibition or inhibition of pollination to mortality of individuals; dust also could inhibit pollination success. These impacts may result in reduced ability of this subpopulation to serve as a seed source for future conservation efforts for this species.

The area of potential exploratory drilling overlaps with subpopulations of this species. Exploratory drilling within this area has the potential to impact this species directly through removal or crushing and/or via dust deposition or impacts to pollinators.

The combination of these potential impacts would result primarily in localized, long-term and permanent, moderate impacts to the bent-flowered milkvetech. Therefore, the 2021 MMP may indirectly impact bent-flowered milkvetech individuals (one out of a total of approximately 653 individuals within 10 populations identified on the PNF) and habitat but would not likely contribute to a loss of viability of the species within the planning area (i.e., PNF-administered lands).

Least Moonwort (*Botrychium simplex*)

Two subpopulations of a single occurrence of least moonwort, a Forest Service sensitive species on the PNF and a forest watch species on the BNF, are located in swales adjacent to Johnson Creek Road (CR 10-413) (IFWIS 2017) in the BNF. Increased vehicle travel on this road associated with SGP activities would increase dust impacts that could impact these subpopulations and the swale habitat they occur in as compared to current conditions. Maintenance work on this road, such as ditch and culvert repair and adding gravel to the road surface also could increase dust impacts as well as increase impacts associated with potential hydrologic alterations on these subpopulations and associated swales. These subpopulations were not observed by Forest Service surveyors in the most recent survey year (2005) (IFWIS 2017); however, if they still exist, increased dust deposition could result in impacts ranging from metabolic inhibition or mortality of individuals.

The combination of these potential impacts would result primarily in localized, long-term and permanent, moderate impacts to the least moonwort. Therefore, the 2021 MMP may indirectly impact least moonwort individuals (two out of a total of approximately 1,731 individuals in 14 populations on the PNF) and habitat but would not likely contribute to a loss of viability of the species within the planning area (i.e., BNF-administered lands).
**Blandow’s Helodium (Helodium blandowii)**

A single occurrence of Blandow’s helodium, a forest watch species on both the PNF and BNF, is found in the analysis area near Trapper Creek, within approximately 100 feet from where the Burntlog Route would cross the Trapper Flat wetland in the BNF (IFWIS 2017). Construction of the road in this area could impact hydrology of the wetland that this species inhabits, which could result in conditions that would not support this occurrence.

The SGP also could impact this occurrence due to dust associated with construction of the road and vehicle travel in this area. Increased dust deposition could result in impacts ranging from metabolic inhibition to mortality of individuals.

The combination of these potential impacts would result primarily in localized, long-term and permanent, moderate impacts to the Blandow’s helodium. Therefore, the 2021 MMP may indirectly impact Blandow’s helodium individuals (one) but would not likely contribute to loss of viability of the species within the planning area (i.e., BNF-administered lands).

**Sweetgrass (Hierochloe odorata)**

Two subpopulations of a single occurrence of sweetgrass, a forest watch species on the BNF, are located in wetlands near Trapper Creek, the closest being approximately 780 feet and the farthest being 1,000 feet from new construction for the Burntlog Route in the BNF (IFWIS 2017). This species is in an area that is hydrologically connected to wetlands that would be impacted by construction of the Burntlog Route, and therefore, it is considered to be within the analysis area. Construction of the Burntlog Route through the wetlands in this area could impact hydrology of the wetland that this species inhabits, which could result in conditions that would not support these subpopulations.

This potential impact would result primarily in localized, long-term and permanent, moderate impacts to sweetgrass. Therefore, the 2021 MMP may indirectly impact sweetgrass individuals (two) and habitat but would not likely contribute to loss of viability of the species within the planning area (i.e., BNF-administered lands).

**Sacajawea’s Bitterroot (Lewisia sacajaweana)**

One occurrence of Sacajawea’s bitterroot, a Forest Service sensitive species on both the PNF and BNF, occurs approximately 300 feet above Warm Lake Road (CR 10-579) and the existing transmission line corridor near the intersection of Warm Lake Road with Curtis Creek Road (IFWIS 2017) in the BNF. This occurrence is on a hillside above a portion of Warm Lake Road, and the polygon for this occurrence overlaps a transmission line access road that would be used during transmission line reconstruction and SGP operation. Spur road construction and use of this dirt road during transmission line reconstruction and SGP operation would create dust that could negatively impact this occurrence of Sacajawea’s bitterroot. Impacts of dust on this species could range from mild metabolic inhibition to mortality of individuals.
The combination of these potential impacts would result primarily in localized, long-term and permanent, moderate impacts to the Sacajawea’s bitterroot. Therefore, the 2021 MMP may indirectly impact Sacajawea’s bitterroot individuals (one out of approximately 157,023 individuals in 27 populations on the PNF) and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area (i.e., BNF-administered lands).

**Rannoch-rush** (*Scheuchzeria palustris*)

One occurrence of Rannoch-rush, a forest watch species on the BNF, is located in a wetland in the Mud Lake area in the BNF (IDFG 2004; IFWIS 2017). This occurrence is within 300 feet of an existing portion of Burnt Log Road (FR 447). This occurrence is likely to be impacted by dust associated with road widening and vehicle travel on the Burntlog Route in this location. This occurrence also could be subject to other potential indirect effects described, under Indirect Impacts. The most likely impact of the SGP on this occurrence is dust associated with construction of the road and vehicle travel in this area. Increased dust deposition could result in impacts ranging from metabolic inhibition or mortality of individuals.

This potential impact would result primarily in localized, long-term and permanent, moderate impacts to the Rannoch-rush. Therefore, the 2021 MMP may indirectly impact Rannoch-rush individuals (one) and habitat but would not likely contribute to loss of viability to the species within the planning area (i.e., BNF-administered lands).

**Impacts to Modeled Potential Habitat for Sensitive and Forest Watch Species**

**Table 4.10-4** presents acres of modeled potential habitat for special status plant species that would be directly impacted under the 2021 MMP by SGP component. Direct removal of potential habitat would occur in these areas, as well as the indirect of impacts described below.

Impacts to habitats for sensitive and forest watch species would predominantly occur at the mine site, with lesser extents of impacts occurring along access roads and transmission lines, including in areas of tall tree clearing. This would result primarily in localized, long-term and permanent, moderate impacts to sensitive and Forest Watch Species, depending on the SGP component and specific modeled habitat impacted.
### Table 4.10-4  Acres of Direct Impacts to Modeled Special Status Plant Potential Habitat under the 2021 MMP

<table>
<thead>
<tr>
<th>Scientific Name (Common Name)</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Off-site Facilities</th>
<th>Total¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allotropa virgata</em> (Candystick)</td>
<td>57.6</td>
<td>8.6</td>
<td>16.3</td>
<td>5.6</td>
<td>-</td>
<td>88.2</td>
</tr>
<tr>
<td><em>Astragalus vexilliflexus var. vexilliflexus</em> (Bent-flowered milkvetch)</td>
<td>6.8</td>
<td>3.1</td>
<td>5.9</td>
<td>2.1</td>
<td>-</td>
<td>17.9</td>
</tr>
<tr>
<td><em>Botrychium lineare and B. simplex</em> (Slender moonwort and least moonwort)</td>
<td>140.4</td>
<td>17.2</td>
<td>45.5</td>
<td>17.8</td>
<td>-</td>
<td>220.8</td>
</tr>
<tr>
<td><em>Botrychium crenulatum</em> (Scalloped moonwort)</td>
<td>1.4</td>
<td>1.6</td>
<td>5.6</td>
<td>2.1</td>
<td>-</td>
<td>10.7</td>
</tr>
<tr>
<td><em>Bryum calobryoides</em> (Beautiful bryum)</td>
<td>1.6</td>
<td>1.6</td>
<td>6.4</td>
<td>2.4</td>
<td>-</td>
<td>10.4</td>
</tr>
<tr>
<td><em>Buxbaumia viridis</em> (Green bug moss)</td>
<td>1.8</td>
<td>7.0</td>
<td>21.8</td>
<td>7.9</td>
<td>-</td>
<td>38.6</td>
</tr>
<tr>
<td><em>Calamagrostis tweedyi</em> (Cascade reedgrass)</td>
<td>499.2</td>
<td>200.6</td>
<td>140.0</td>
<td>46.7</td>
<td>0.8</td>
<td>887.2</td>
</tr>
<tr>
<td><em>Carex livida</em> (Livid sedge)</td>
<td>165.5</td>
<td>20.8</td>
<td>45.6</td>
<td>17.4</td>
<td>-</td>
<td>249.2</td>
</tr>
<tr>
<td><em>Carex straminiformis</em> (Shasta sedge)</td>
<td>72.6</td>
<td>23.4</td>
<td>8.1</td>
<td>-</td>
<td>-</td>
<td>104.1</td>
</tr>
<tr>
<td><em>Cicuta bulbifera</em> (Bulblet-bearing water hemlock)</td>
<td>60.4</td>
<td>6.6</td>
<td>126.8</td>
<td>39.2</td>
<td>-</td>
<td>233.0</td>
</tr>
<tr>
<td><em>Douglasia idahoensis</em> (Idaho douglasia)</td>
<td>22.0</td>
<td>4.0</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>27.5</td>
</tr>
<tr>
<td><em>Draba incerta</em> (Yellowstone draba)</td>
<td>34.9</td>
<td>18.2</td>
<td>6.3</td>
<td>-</td>
<td>-</td>
<td>59.4</td>
</tr>
<tr>
<td><em>Drosera intermedia</em> (Spoonleaf sundew)</td>
<td>165.5</td>
<td>20.8</td>
<td>45.6</td>
<td>17.4</td>
<td>-</td>
<td>249.2</td>
</tr>
<tr>
<td><em>Epilobium palustre</em> (Swamp willow weed)</td>
<td>0.3</td>
<td>0.2</td>
<td>9.4</td>
<td>3.7</td>
<td>-</td>
<td>13.5</td>
</tr>
<tr>
<td><em>Epipactis gigantea</em> (Giant helleborine orchid)</td>
<td>1.7</td>
<td>9.0</td>
<td>3.2</td>
<td>-</td>
<td>-</td>
<td>13.9</td>
</tr>
<tr>
<td><em>Helodium blandowii</em> (Blandow's helodium)</td>
<td>142.6</td>
<td>3.5</td>
<td>40.0</td>
<td>15.1</td>
<td>-</td>
<td>201.3</td>
</tr>
<tr>
<td><em>Hierochloe odorata</em> (Sweetgrass)</td>
<td>84.3</td>
<td>19.8</td>
<td>66.1</td>
<td>19.5</td>
<td>-</td>
<td>189.7</td>
</tr>
<tr>
<td><em>Lewisia sacajaweana</em> (Sacajawea's bitterroot)</td>
<td>141.5</td>
<td>178.5</td>
<td>70.5</td>
<td>23.0</td>
<td>-</td>
<td>413.5</td>
</tr>
<tr>
<td><em>Mimulus clivicola</em> (Bank monkeyflower)</td>
<td>2.1</td>
<td>46.9</td>
<td>15.5</td>
<td>-</td>
<td>-</td>
<td>64.4</td>
</tr>
</tbody>
</table>

¹ Total includes all mines in the mine site.
<table>
<thead>
<tr>
<th>Scientific Name (Common Name)</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Off-site Facilities</th>
<th>Total¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Penstemon laxus</em> (Tufted penstemon)</td>
<td>28.4</td>
<td>1.2</td>
<td>30.7</td>
<td>10.1</td>
<td></td>
<td>70.4</td>
</tr>
<tr>
<td><em>Polystichum kruckebergii</em> (Kruckeberg’s sword-fern)</td>
<td>97.2</td>
<td>43.8</td>
<td>48.6</td>
<td>13.7</td>
<td>0.3</td>
<td>203.5</td>
</tr>
<tr>
<td><em>Rhynchospora alba</em> (White beaksedge)</td>
<td>34.7</td>
<td>1.6</td>
<td>32.9</td>
<td>12.2</td>
<td></td>
<td>81.4</td>
</tr>
<tr>
<td><em>Sanicula graveolens</em> (Sierra sanicle)</td>
<td>119.9</td>
<td>46.7</td>
<td>13.4</td>
<td>3.7</td>
<td>0.3</td>
<td>183.7</td>
</tr>
<tr>
<td><em>Saxifraga tolmiei var. ledifolia</em> (Tolmie's saxifrage)</td>
<td>52.2</td>
<td>49.3</td>
<td>18.0</td>
<td>6.1</td>
<td>0.3</td>
<td>125.9</td>
</tr>
<tr>
<td><em>Scheuchzeria palustris</em> (Rannoch-rush)</td>
<td>165.5</td>
<td>20.8</td>
<td>45.6</td>
<td>17.4</td>
<td></td>
<td>249.2</td>
</tr>
<tr>
<td><em>Sedum borschii</em> and <em>S. leibergii</em> (Borch's stonecrop and Leiberg stonecrop)</td>
<td>32.0</td>
<td>3.1</td>
<td>0.6</td>
<td>0.4</td>
<td></td>
<td>35.9</td>
</tr>
<tr>
<td><em>Triantha occidentalis ssp. brevistyla</em> (Short-style tofieldia)</td>
<td>132.8</td>
<td>12.6</td>
<td>30.5</td>
<td>11.5</td>
<td></td>
<td>187.4</td>
</tr>
</tbody>
</table>

Source: Stantec 2022.

¹Due to rounding, numbers presented may not sum precisely. Total acreages for features are presented as modeled potential habitat for many species overlap that of other species.
Increased Potential for Non-Native Plant Establishment and Spread

Anticipated acreages of vegetation disturbance to previously undisturbed vegetation communities both inside and outside Forest Service boundaries under the 2021 MMP are presented in Table 4.10-5. Increased establishment and spread of non-native plants are possible in these areas. This would result primarily in regional, localized, temporary, short-term, and long-term, moderate impacts related to the increased potential for non-native plant establishment, depending on the SGP component and specific vegetation type impacted.

Table 4.10-5  Total Acres of Disturbance to Vegetation Communities due to SGP Components under the 2021 MMP

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing¹</th>
<th>Off-site Facilities</th>
<th>Total²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest PVGs (1-11) within Forest Service boundaries</td>
<td>1,011.8</td>
<td>427.0</td>
<td>667.8</td>
<td>226.8</td>
<td>4.5</td>
<td>2,338.0</td>
</tr>
<tr>
<td>Non-forest Areas within Forest Service boundaries</td>
<td>663.2</td>
<td>42.8</td>
<td>50.5</td>
<td>19.0</td>
<td>0</td>
<td>775.5</td>
</tr>
<tr>
<td>LANDFIRE vegetation outside Forest Service boundaries</td>
<td>0</td>
<td>0</td>
<td>292.4</td>
<td>133.5</td>
<td>24.3</td>
<td>450.2</td>
</tr>
<tr>
<td>Totals²</td>
<td>1,675</td>
<td>469.8</td>
<td>1,010.8</td>
<td>379.3</td>
<td>28.8</td>
<td>3,563.7</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts to forest PVGs and non-forest areas within Forest Service boundaries were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017a) and VCMQI mapping (Forest Service 2016b, 2021d), omitting areas of previous mine site disturbance (Perpetua 2021a). Acres of direct impacts to LANDFIRE vegetation outside Forest Service boundaries were calculated by overlaying SGP components outside Forest Service boundaries with LANDFIRE data (USGS 2016a).

¹Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.
²Due to rounding, numbers presented in this table may not sum precisely to the totals provided.
³Does not include 15 acres of unmapped PVG areas located on the Salmon-Challis National Forest.

4.10.2.3  Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the mine site and utilities would operate similarly to the 2021 MMP. However, the Burntlog Route would not be constructed, and the Johnson Creek Route would be used for access during mine construction, operations, and closure and reclamation. The Landmark Maintenance Facility would be relocated to the west and located on NFS land near the intersection of Warm Lake and Johnson Creek roads, where it would be accessed via Warm Lake Road.

Impacts to Forested Vegetation Communities within Forest Service-Managed Land

Anticipated acreages of disturbance associated with all SGP features in mapped PVGs under the Johnson Creek Route Alternative during the construction phase are presented in Table 4.10-6. These areas would not maintain or move towards desired conditions into the foreseeable future. As under the 2021 MMP, most impacts to PVGs would be related to disturbance activities at the mine site and would occur in the Warm, Dry Subalpine Fir (PVG 7) and Persistent Lodgepole Pine (PVG 10) types. This would result primarily in localized, long-term and permanent, moderate impacts to forested PVGs within Forest Service-managed land, depending on the SGP component and specific PVG type impacted.
### Table 4.10-6 Acres of Disturbance to Previously Undisturbed Forested PVGs under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>PVG</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing¹</th>
<th>Off-site Facilities</th>
<th>Total²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVG 1 – Dry Ponderosa Pine / Xeric Douglas-fir</td>
<td>-</td>
<td>33.5</td>
<td>2.6</td>
<td>1.3</td>
<td>-</td>
<td>37.4</td>
</tr>
<tr>
<td>PVG 2 – Warm, Dry Douglas-fir / Moist Ponderosa Pine</td>
<td>0.5</td>
<td>95.7</td>
<td>167.4</td>
<td>59.9</td>
<td>-</td>
<td>323.5</td>
</tr>
<tr>
<td>PVG 3 – Cool, Moist Douglas-fir</td>
<td>-</td>
<td>-</td>
<td>8.5</td>
<td>3.0</td>
<td>-</td>
<td>11.6</td>
</tr>
<tr>
<td>PVG 4 – Cool, Dry Douglas-fir</td>
<td>3.1</td>
<td>55.8</td>
<td>109.0</td>
<td>38.8</td>
<td>0.3</td>
<td>207.0</td>
</tr>
<tr>
<td>PVG 5 – Dry Grand Fir</td>
<td>-</td>
<td>-</td>
<td>71.0</td>
<td>23.8</td>
<td>-</td>
<td>94.8</td>
</tr>
<tr>
<td>PVG 6 – Moist Grand Fir</td>
<td>-</td>
<td>-</td>
<td>45.7</td>
<td>15.5</td>
<td>-</td>
<td>61.2</td>
</tr>
<tr>
<td>PVG 7 – Warm, Dry Subalpine Fir</td>
<td>491.4</td>
<td>30.4</td>
<td>81.5</td>
<td>28.5</td>
<td>1.9</td>
<td>633.7</td>
</tr>
<tr>
<td>PVG 8 – Cool Moist Subalpine Fir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PVG 9 – Hydric Subalpine Fir</td>
<td>3.8</td>
<td>12.1</td>
<td>11.7</td>
<td>4.4</td>
<td>-</td>
<td>32.0</td>
</tr>
<tr>
<td>PVG 10 – Persistent Lodgepole Pine</td>
<td>250.2</td>
<td>50.5</td>
<td>171.5</td>
<td>53.8</td>
<td>2.6</td>
<td>528.6</td>
</tr>
<tr>
<td>PVG 11 – High Elevation Subalpine Fir (with Whitebark Pine)</td>
<td>-</td>
<td>2.7</td>
<td>19.6</td>
<td>7.4</td>
<td>-</td>
<td>29.8</td>
</tr>
<tr>
<td>TOTALS²</td>
<td>749.0</td>
<td>280.6</td>
<td>688.5</td>
<td>236.5</td>
<td>4.8</td>
<td>1,959.4</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts to modeled habitat were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017a), omitting areas of previous mine site disturbance (Perpetua 2021a).

¹Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.

²Due to rounding, numbers presented in this table may not sum precisely to the totals provided.

**Impacts to Non-Forested Vegetation Communities within Forest Service-Managed Land**

Anticipated acreages of direct impacts of vegetation clearing to previously undisturbed areas identified as not successional to forested PVGs within Forest Service-managed lands under the Johnson Creek Route Alternative are presented in Table 4.10-7. These areas would not maintain or move towards desired conditions in the foreseeable future. As under the 2021 MMP, most impacts to these areas would be related to disturbance activities at the mine site and would occur in the Douglas-fir and Lodgepole Pine existing vegetation types. This would result primarily in localized, short-term, long-term, and permanent, moderate impacts to non-forested vegetation communities within Forest Service-managed land, depending on the SGP component and specific vegetation type impacted.
### Table 4.10-7  Acres of Disturbance to Areas Identified as not Successional to Forested PVGs under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Existing Vegetation Type(^1)</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Total(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Burned Forest Shrublands</td>
<td>-</td>
<td>0.5</td>
<td>3.5</td>
<td>1.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Burned Herblands</td>
<td>5.4</td>
<td>1.2</td>
<td>7.7</td>
<td>2.5</td>
<td>16.8</td>
</tr>
<tr>
<td>Burned Sparse Vegetation</td>
<td>0.3</td>
<td>0.2</td>
<td>1.1</td>
<td>0.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Developed</td>
<td>8.9</td>
<td>0.3</td>
<td>0.2</td>
<td>-</td>
<td>9.3</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>6.7</td>
<td>8.3</td>
<td>10.5</td>
<td>3.7</td>
<td>29.1</td>
</tr>
<tr>
<td>Douglas-fir/Lodgepole Pine</td>
<td>5.9</td>
<td>0.1</td>
<td>0.1</td>
<td>-</td>
<td>6.1</td>
</tr>
<tr>
<td>Douglas-fir/Ponderosa Pine</td>
<td>-</td>
<td>1.8</td>
<td>0.7</td>
<td>0.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Engelmann’s Spruce</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>0.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Forblands</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>0.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Forest Shrublands</td>
<td>-</td>
<td>-</td>
<td>4.0</td>
<td>1.2</td>
<td>5.3</td>
</tr>
<tr>
<td>Grasslands</td>
<td>2.0</td>
<td>0.3</td>
<td>1.5</td>
<td>0.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Lodgepole Pine</td>
<td>10.2</td>
<td>12.9</td>
<td>5.9</td>
<td>2.7</td>
<td>31.7</td>
</tr>
<tr>
<td>Mountain Big Sagebrush</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mountain shrubland</td>
<td>-</td>
<td>2.6</td>
<td>-</td>
<td>-</td>
<td>2.6</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>-</td>
<td>0.4</td>
<td>4.5</td>
<td>1.7</td>
<td>6.6</td>
</tr>
<tr>
<td>Riparian Herblands</td>
<td>1.9</td>
<td>0.2</td>
<td>1.3</td>
<td>0.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Riparian Shrublands/Deciduous Forests</td>
<td>1.7</td>
<td>0.1</td>
<td>4.7</td>
<td>2.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Sparse Vegetation</td>
<td>7.2</td>
<td>4.4</td>
<td>0.1</td>
<td>-</td>
<td>11.7</td>
</tr>
<tr>
<td>Subalpine Fir</td>
<td>-</td>
<td>0.1</td>
<td>1.0</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Water</td>
<td>-</td>
<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Whitebark Pine</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td>TOTALS(^2)</td>
<td>50.0</td>
<td>33.5</td>
<td>49.7</td>
<td>18.7</td>
<td>151.9</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017) and VCMQI mapping (Forest Service 2016b, 2021d), omitting areas of previous mine site disturbance (Perpetua 2021a).  
\(^1\)PVG mapping and existing vegetation mapping are performed using different processes and different objectives. As such, forest existing vegetation types commonly occur within areas identified as not successional to forests in PVG mapping, and alternatively, non-forest existing vegetation types commonly occur in areas identified as successional to forests in PVG mapping.  
\(^2\)Due to rounding, numbers presented in this table may not sum precisely to the totals provided.

**Impacts to Vegetation Communities Outside Forest Service-Managed Land**

Anticipated acreages of direct impacts of vegetation clearing in vegetation communities outside Forest Service-managed lands under the Johnson Creek Route Alternative are presented in Table 4.10-8. These areas also would experience the types of indirect impacts described below. This would result primarily in localized, short-term, long-term, and permanent, moderate impacts to vegetation communities outside Forest Service-managed land, depending on the SGP component and specific vegetation type impacted.
Table 4.10-8 Acres of Disturbance to Vegetated Acres Outside Forest Service-Managed Lands under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>LANDFIRE Vegetation Class Name</th>
<th>Utilities</th>
<th>Tall Tree Clearing(^1)</th>
<th>Off-site Facilities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Western North American Temperate Ruderal Grassland</td>
<td>33.7</td>
<td>17.9</td>
<td>-</td>
<td>51.6</td>
</tr>
<tr>
<td>Interior Western North American Temperate Ruderal Shrubland</td>
<td>6.1</td>
<td>2.8</td>
<td>-</td>
<td>9.0</td>
</tr>
<tr>
<td>Inter-Mountain Basins Montane Sagebrush Steppe</td>
<td>2.3</td>
<td>1.1</td>
<td>-</td>
<td>3.4</td>
</tr>
<tr>
<td>Middle Rocky Mountain Montane Douglas-fir Forest and Woodland</td>
<td>0.6</td>
<td>0.5</td>
<td>-</td>
<td>1.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest</td>
<td>31.2</td>
<td>14.7</td>
<td>10.9</td>
<td>56.8</td>
</tr>
<tr>
<td>Northern Rocky Mountain Foothill Conifer Wooded Steppe</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Lower Montane Riparian Shrubland</td>
<td>5.5</td>
<td>2.4</td>
<td>0.3</td>
<td>8.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Lower Montane Riparian Woodland</td>
<td>6.3</td>
<td>3.0</td>
<td>5.9</td>
<td>15.2</td>
</tr>
<tr>
<td>Northern Rocky Mountain Mesic Montane Mixed Conifer Forest</td>
<td>2.6</td>
<td>1.1</td>
<td>0.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Northern Rocky Mountain Montane-Foothill Deciduous Shrubland</td>
<td>7.8</td>
<td>2.3</td>
<td>-</td>
<td>10.1</td>
</tr>
<tr>
<td>Northern Rocky Mountain Ponderosa Pine Woodland and Savanna</td>
<td>16.6</td>
<td>5.6</td>
<td>0.9</td>
<td>23.0</td>
</tr>
<tr>
<td>Northern Rocky Mountain Subalpine Deciduous Shrubland</td>
<td>3.5</td>
<td>1.0</td>
<td>-</td>
<td>4.5</td>
</tr>
<tr>
<td>Rocky Mountain Alpine-Montane Wet Meadow</td>
<td>38.3</td>
<td>20.1</td>
<td>0.0</td>
<td>58.5</td>
</tr>
<tr>
<td>Rocky Mountain Cliff Canyon and Massive Bedrock</td>
<td>1.7</td>
<td>0.4</td>
<td>0.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Rocky Mountain Lodgepole Pine Forest</td>
<td>16.5</td>
<td>6.1</td>
<td>2.9</td>
<td>25.5</td>
</tr>
<tr>
<td>Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>Rocky Mountain Subalpine-Montane Mesic Meadow</td>
<td>1.7</td>
<td>0.7</td>
<td>-</td>
<td>2.4</td>
</tr>
<tr>
<td>Open Water</td>
<td>6.6</td>
<td>3.3</td>
<td>-</td>
<td>9.9</td>
</tr>
<tr>
<td>Agricultural, Developed</td>
<td>111.4</td>
<td>50.5</td>
<td>2.5</td>
<td>164.3</td>
</tr>
<tr>
<td>TOTALS(^2)</td>
<td>292.4</td>
<td>133.5</td>
<td>24.3</td>
<td>450.2</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts were calculated by overlaying SGP components outside Forest Service boundaries with LANDFIRE data (USGS 2016a).

\(^1\)Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.

\(^2\)Due to rounding, numbers presented in this table may not sum precisely to the totals provided.
Impacts to Whitebark Pine

The Johnson Creek Route Alternative would impact 108.4 acres of occupied whitebark pine habitat and would remove an estimated 767 individual trees, 23 of which would be mature, cone-bearing individuals. This would result primarily in localized, long-term and permanent, moderate impacts to the whitebark pine. The Forest Service has preliminarily determined that the Johnson Creek Route Alternative would impact whitebark pine but would not jeopardize the continued existence of this species.

Impacts to Known Locations of Sensitive and Forest Watch Species

Construction of the Johnson Creek Route Alternative would impact several known occurrences of sensitive and forest watch plant species as described in the following subsections. However, impacts to Blandow’s helodium (*Helodium blandowii*), Sweetgrass (*Hierochloe odorata*), and Rannoch-rush (*Scheuzeria palustris*) populations would not occur under this alternative because these species do not occur near the components of the Johnson Creek Route Alternative.

The impacts to the Bent-flowered Milkvetch and Sacajawea’s Bitterroot under the Johnson Creek Route Alternative are the same as described for the 2021 MMP.

**Least Moonwort (*Botrychium simplex*)**

The Johnson Creek Route Alternative could impact subpopulations of the occurrence of least moonwort in the same manner as described under the 2021 MMP. However, due to the localized nature of impacts within roadside swales under the Johnson Creek Route Alternative, impacts to this species may be greater than under the 2021 MMP. The combination of these potential impacts would result primarily in localized, long-term and permanent, moderate impacts to the least moonwort. Therefore, the Johnson Creek Route Alternative may indirectly impact least moonwort individuals (two) and habitat but would not likely contribute to a loss of viability of the species within the planning area (i.e., BNF-administered lands).

Impacts to Modeled Potential Habitat for Sensitive and Forest Watch Species

Table 4.10-9 presents acreages of direct impacts to modeled potential habitat for special status plant species that would be directly impacted under the Johnson Creek Route Alternative. Direct removal of potential habitat would occur in these areas, as well as the types of impacts described in Section 4.10.2.2.

As described for the 2021 MMP, impacts to habitats for sensitive and forest watch species would predominantly occur at the mine site, with lesser extents of impacts occurring along access roads and transmission lines, including in areas of tall tree clearing. This would result primarily in localized, long-term and permanent, moderate impacts to sensitive and Forest Watch Species, depending on the SGP component and specific modeled habitat impacted.
<table>
<thead>
<tr>
<th>Scientific Name (Common Name)</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing</th>
<th>Off-site Facilities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allotropa virgata</em> (Candystick)</td>
<td>55.8</td>
<td>5.6</td>
<td>16.3</td>
<td>5.6</td>
<td>1.8</td>
<td>85.2</td>
</tr>
<tr>
<td><em>Astragalus vexilliflexus</em> var. <em>vexilliflexus</em> (Bent-flowered milkvetch)</td>
<td>6.8</td>
<td>1.9</td>
<td>5.9</td>
<td>2.1</td>
<td>-</td>
<td>16.7</td>
</tr>
<tr>
<td><em>Botrychium lineare</em> and <em>B. simplex</em> (Slender moonwort and least moonwort)</td>
<td>140.6</td>
<td>5.9</td>
<td>45.4</td>
<td>17.8</td>
<td>-</td>
<td>209.7</td>
</tr>
<tr>
<td><em>Botrychium crenulatum</em> (Scalloped moonwort)</td>
<td>1.4</td>
<td>2.1</td>
<td>5.6</td>
<td>2.1</td>
<td>-</td>
<td>11.2</td>
</tr>
<tr>
<td><em>Bryum calobryoides</em> (Beautiful bryum)</td>
<td>-</td>
<td>2.6</td>
<td>6.4</td>
<td>2.4</td>
<td>-</td>
<td>11.4</td>
</tr>
<tr>
<td><em>Buxbaumia viridis</em> (Green bug moss)</td>
<td>1.8</td>
<td>9.1</td>
<td>21.8</td>
<td>7.9</td>
<td>-</td>
<td>40.7</td>
</tr>
<tr>
<td><em>Calamagrostis tweedyi</em> (Cascade reedgrass)</td>
<td>498.0</td>
<td>20.3</td>
<td>139.6</td>
<td>46.7</td>
<td>-</td>
<td>704.7</td>
</tr>
<tr>
<td><em>Carex livida</em> (Livid sedge)</td>
<td>165.6</td>
<td>4.5</td>
<td>45.6</td>
<td>17.4</td>
<td>-</td>
<td>233.1</td>
</tr>
<tr>
<td><em>Carex straminiformis</em> (Shasta sedge)</td>
<td>-</td>
<td>3.8</td>
<td>23.4</td>
<td>8.1</td>
<td>-</td>
<td>35.4</td>
</tr>
<tr>
<td><em>Cicuta bulbifera</em> (Bulblet-bearing water hemlock)</td>
<td>59.7</td>
<td>13.5</td>
<td>126.7</td>
<td>39.2</td>
<td>-</td>
<td>239.1</td>
</tr>
<tr>
<td><em>Douglasia idahoensis</em> (Idaho douglasia)</td>
<td>-</td>
<td>1.1</td>
<td>4.0</td>
<td>1.5</td>
<td>-</td>
<td>6.6</td>
</tr>
<tr>
<td><em>Draba incerta</em> (Yellowstone draba)</td>
<td>-</td>
<td>1.9</td>
<td>18.2</td>
<td>6.3</td>
<td>-</td>
<td>26.4</td>
</tr>
<tr>
<td><em>Drosera intermedia</em> (Spoonleaf sundew)</td>
<td>165.6</td>
<td>4.5</td>
<td>45.6</td>
<td>17.4</td>
<td>-</td>
<td>233.1</td>
</tr>
<tr>
<td><em>Epilobium palustre</em> (Swamp willow weed)</td>
<td>0.3</td>
<td>0.5</td>
<td>9.4</td>
<td>3.7</td>
<td>-</td>
<td>13.8</td>
</tr>
<tr>
<td><em>Epipactis gigantea</em> (Giant helleborine orchid)</td>
<td>2.9</td>
<td>9.0</td>
<td>3.2</td>
<td>-</td>
<td>-</td>
<td>15.1</td>
</tr>
<tr>
<td>Scientific Name (Common Name)</td>
<td>Mine Site</td>
<td>Access Roads</td>
<td>Utilities</td>
<td>Tall Tree Clearing</td>
<td>Off-site Facilities</td>
<td>Total¹</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td>--------------</td>
<td>-----------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Helodium blandowii (Blandow's helodium)</td>
<td>142.7</td>
<td>4.3</td>
<td>40.0</td>
<td>15.1</td>
<td>-</td>
<td>202.2</td>
</tr>
<tr>
<td>Hierochloe odorata (Sweetgrass)</td>
<td>84.4</td>
<td>5.8</td>
<td>66.1</td>
<td>19.5</td>
<td>-</td>
<td>175.8</td>
</tr>
<tr>
<td>Lewisia sacajaweana (Sacajawea’s bitterroot)</td>
<td>140.8</td>
<td>6.4</td>
<td>70.5</td>
<td>23.0</td>
<td>-</td>
<td>240.7</td>
</tr>
<tr>
<td>Mimulus clivicola (Bank monkeyflower)</td>
<td>-</td>
<td>4.3</td>
<td>46.8</td>
<td>15.5</td>
<td>-</td>
<td>66.6</td>
</tr>
<tr>
<td>Penstemon laxus (Tufted penstemon)</td>
<td>28.0</td>
<td>2.9</td>
<td>30.7</td>
<td>10.1</td>
<td>-</td>
<td>71.8</td>
</tr>
<tr>
<td>Polystichum kruckebergii (Kruckeberg’s sword-fern)</td>
<td>96.8</td>
<td>9.7</td>
<td>48.6</td>
<td>13.7</td>
<td>-</td>
<td>168.8</td>
</tr>
<tr>
<td>Rhynchospora alba (White beaksedge)</td>
<td>34.8</td>
<td>3.9</td>
<td>32.9</td>
<td>12.2</td>
<td>-</td>
<td>83.7</td>
</tr>
<tr>
<td>Sanicula graveolens (Sierra sanicle)</td>
<td>119.2</td>
<td>9.5</td>
<td>13.4</td>
<td>3.7</td>
<td>-</td>
<td>145.8</td>
</tr>
<tr>
<td>Saxifraga tolmiei var. ledifolia (Tolmie’s saxifrage)</td>
<td>52.2</td>
<td>4.2</td>
<td>18.0</td>
<td>6.1</td>
<td>-</td>
<td>80.5</td>
</tr>
<tr>
<td>Scheuchzeria palustris (Rannoch-rush)</td>
<td>165.6</td>
<td>4.5</td>
<td>45.6</td>
<td>17.4</td>
<td>-</td>
<td>233.1</td>
</tr>
<tr>
<td>Sedum borschii and S. leibergii (Borch’s stonecrop and Leiberg) stonecrop</td>
<td>32.0</td>
<td>1.3</td>
<td>0.6</td>
<td>0.4</td>
<td>-</td>
<td>34.2</td>
</tr>
<tr>
<td>Triantha occidentalis ssp. brevistyla (Short-style tofieldia)</td>
<td>132.8</td>
<td>1.1</td>
<td>30.5</td>
<td>11.5</td>
<td>-</td>
<td>175.9</td>
</tr>
</tbody>
</table>

Source: Acres of direct impacts to modeled habitat were calculated by overlaying SGP components with modeled potential habitat reported in Stantec 2022.

¹Due to rounding, numbers presented in this table may not sum precisely to the totals provided. No total acreages are presented for SGP components in this table as modeled potential habitat for many species overlaps that of other species.
Increased Potential for Non-Native Plant Establishment and Spread

Anticipated acreages of vegetation disturbance to previously undisturbed vegetation communities both inside and outside Forest Service boundaries under the Johnson Creek Route Alternative are presented in Table 4.10-10. Increased establishment and spread of non-native plants is possible in these areas. This would result primarily in regional, localized, temporary, short-term, and long-term, moderate impacts related to the increased potential for non-native plant establishment, depending on the SGP component and specific vegetation type impacted.

Table 4.10-10 Total acres of Disturbance to Vegetation Communities due to SGP Components under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Mine Site</th>
<th>Access Roads</th>
<th>Utilities</th>
<th>Tall Tree Clearing¹</th>
<th>Off-site Facilities</th>
<th>Total²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest PVGs (1-11) within Forest Service boundaries</td>
<td>1,001.5</td>
<td>282.2³</td>
<td>666.5</td>
<td>226.8</td>
<td>4.8</td>
<td>2,181.8</td>
</tr>
<tr>
<td>Non-forest Areas within Forest Service boundaries</td>
<td>661.5</td>
<td>36.6</td>
<td>50.2</td>
<td>19</td>
<td>0</td>
<td>767.3</td>
</tr>
<tr>
<td>LANDFIRE vegetation outside Forest Service boundaries</td>
<td>0</td>
<td>0</td>
<td>292.4</td>
<td>133.5</td>
<td>24.3</td>
<td>450.2</td>
</tr>
<tr>
<td>TOTALS²</td>
<td>1,663.0</td>
<td>318.8</td>
<td>1,009.1</td>
<td>379.3</td>
<td>29.1</td>
<td>3,399.3</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of direct impacts to forest PVGs and non-forest areas within Forest Service boundaries were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017) and VCMQI mapping (Forest Service 2016b, 2021d), omitting areas of previous mine site disturbance (Perpetua 2021a). Acres of direct impacts to LANDFIRE vegetation outside Forest Service boundaries were calculated by overlaying SGP components outside Forest Service boundaries with LANDFIRE data (USGS 2016a).

¹Tall tree clearing would only be performed in areas with tree species, and as such, tall tree clearing may not occur to the full extent of acreages reported in this column.
²Due to rounding, numbers presented in this table may not sum precisely to the totals provided.
³Does not include 10 acres of unmapped PVG areas located on the Salmon-Challis National Forest.

4.10.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Vegetation.

4.10.4 Irreversible and Irretrievable Commitments of Public Resources

4.10.4.1 No Action Alternative

Under the No Action Alternative, there would be no irreversible or irretrievable commitment of vegetation resources.
4.10.4.2 Action Alternatives

Certain biological resources that would be affected by the 2021 MMP and the Johnson Creek Route Alternative are renewable only over long-time spans, including mature vegetation, special status plants, seedbanks, and topsoil. Loss of these resources would be considered irreversible. Soils would be stockpiled and reused to the greatest degree possible, but there would still be some irreversible commitment of soil to the SGP under this alternative.

The 2021 MMP and Johnson Creek Route Alternative would remove the land from other uses while the SGP is in operation, but the use would eventually be reversed through revegetation except for the approximately 278 acres of land where revegetation would not occur (i.e., in areas of new, permanent pit lakes or portions of pit highwalls that are too steep for re-vegetating). The temporal loss of the land for other uses would be irretrievable. This includes the loss of soil resources; even with reclamation (Tetra Tech 2021a), the temporal loss of the resource is irretrievable. Whitebark pine individuals removed for construction of the SGP would be irretrievable. Vegetation impacts also be greater under the 2021 MMP in the area of the Meadow Creek Lookout Road (FR 51290) from the Burntlog Route at the upper portion of Blowout Creek drainage to Monumental Summit, which would be improved for public access to connect with Thunder Mountain Road under this alternative.

4.10.5 Short-term Uses versus Long-term Productivity

4.10.5.1 No Action Alternative

Under this alternative, SGP would not be undertaken. Consequently, there would be no change in the current status of vegetation conditions in the SGP area, and no impacts to productivity would occur.

4.10.5.2 Action Alternatives

Short-term uses of vegetation resources for construction and operation of the 2021 MMP and Johnson Creek Route Alternative would impact the long-term productivity of these resources. The time required for revegetated areas to return to their pre-impact functionality, or for reclaimed areas to achieve functionality, would depend on the current condition and physical characteristics of each disturbance location and vegetation type present. In general, organic soils would take much longer to return relative to mineral soils (particularly alluvial soils); forested areas would take much longer to return relative to herbaceous vegetation; and vegetation in higher elevations would take longer to return relative to lower elevations where growing seasons are longer.

Long-term impacts on vegetation productivity also could result from indirect impacts on vegetation adjacent to the mine site or new/improved access roads. Fragmentation and changes to vegetation composition would reduce the functional capacity of vegetated areas, which would permanently reduce vegetation productivity in the area. Mine operations and related actions of the 2021 MMP and Johnson Creek Route Alternative would dominate land use, and predominantly prevent vegetation re-growth, on approximately 278 acres of land containing existing vegetation resources. Some portions of the analysis area containing existing vegetation resources, particularly those in the footprints of the pits, TSF, and TSF Buttress, would likely never return to their pre-SGP productive capacity due to limitation on rooting depth (most applicable to larger shrub and tree species) related to the depth of the growth media and waste rock that would function as substrate for the foreseeable future.
Construction and operation of the mine could also affect long-term vegetation productivity by increasing sedimentation from erosion and increasing the amount of pollutants and fine-grained sediments delivered to the area via surface water runoff.

4.11 Wetlands and Riparian Resources

4.11.1 Impact Definitions and Effects Analysis Indicators and Methodology

Wetlands and riparian resources were identified as a significant issue. The analysis of effects to wetlands and riparian resources includes the following issues and indicators:

**Issue:** Construction and operation of mine infrastructure would remove wetlands and riparian resources, impact ecological function, and fragment wetland habitat.

**Indicators:**

- Acres of wetland and riparian habitat permanently lost through construction of Project components.
- Acres of wetland and riparian habitat temporarily lost through construction of Project components.
- Functional units of high-value wetlands lost due to project construction, as demonstrated using the functional assessment method.
- Area of wetlands that would be affected by new or improved roads.
- Qualitative analysis of effects of wetland and riparian habitat fragmentation in affected areas.

**Issue:** The SGP may affect water balance, which could reduce seasonal water input frequency and duration for wetlands adjacent to and downstream of SGP features.

**Indicator:** Acres of wetland that would be within the footprint of groundwater drawdown.

**Issue:** SGP-related activities may affect wetlands and riparian areas through changes to water temperature, and concentration of key contaminants.

**Indicator:** Qualitative analysis of estimated changes in water quality parameters based on predictive water modelling in wetland areas.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Aquatic Resources, to include wetlands, have been delineated within the analysis area have been delineated as part of multiple baseline studies conducted between 2011 and 2019. The data from these reports is used to describe the baseline condition relative to the distribution and quantity of wetlands, streams, open waters, and riparian areas. In addition to delineating wetlands, wetland functions and values were assessed using the Montana Wetland Assessment Method (MWAM) (Berglund and McEldowney
The MWAM is a functional assessment approach for quantifying wetland impacts and mitigation that is regionally appropriate for Idaho.

4.11.2 Direct and Indirect Effects

4.11.2.1 No Action Alternative

The SGP would not be implemented; therefore, there would be no SGP-related direct or indirect effects to wetlands or riparian areas. Wetlands and riparian areas in the mine site portion of the analysis area would continue to be affected by existing natural events such as landslides and fires and human-induced effects from existing sources of sedimentation (e.g., Blowout Creek), and contamination (e.g., legacy mining, including tailings in floodplains, and stream diversions). Wetlands would continue to function within natural ecosystem processes that include these natural events as they have evolved with those events and are adapted to the ongoing disturbance regime. Ecological succession would continue to occur in these areas, with changes driven by disturbance and species maturation.

The approximately 847 acres of the mine site and vicinity modified by human activity and considered highly disturbed would continue to affect wetland and waterway functions through sedimentation and erosion into wetlands and riparian areas. Blowout Creek would continue to contribute sediment and erosion to downstream waters and wetlands. Permitted exploration activities within the mine site would continue to occur and could include small, localized impacts to wetlands and riparian areas.

4.11.2.2 2021 MMP

Construction of the TSF, TSF Buttress, open pits, new roads and improvements to existing roads, transmission lines and associated access roads, borrow sites, new off-site facilities, and other surface disturbances in the analysis area would result in impacts to wetlands and riparian areas and their associated functions. Losses of wetland and riparian areas and their functions would occur throughout the construction and operation phases.

Loss of Wetland and Riparian Areas

Mine Site Focus Area

Acres of wetlands and riparian areas (RCAs) that would be directly lost and linear feet of streams that would be lost under the 2021 MMP are shown in Table 4.11-1. This table also presents acres that would be indirectly lost due to wetland type conversion due to the clearing of tall trees around the transmission line. However, potential wetland and riparian area losses due to other indirect impacts (e.g., hydrology changes) would be contained within a 45.08-acre area of delineated wetlands within the mine dewatering drawdown area (Figure 4.8-10). This acreage represents an over-estimate of actual potential indirect effects as some of that area is accounted for within direct affects and dewatering drawdown would not affect wetlands unless they are hydraulically connected to the groundwater experiencing drawdown. All wetland and RCA impacts at the mine site would occur within the Headwaters East Fork SFSR watershed. The magnitude of impacts would be major (i.e., a large measurable change), localized, and the impacts would range from temporary to permanent.
Off-Site Focus Area

Acres of wetlands and RCAs that would be directly impacted in the off-site focus area under the 2021 MMP are shown in Table 4.11-2 and by HUC 10 drainage basin in Table 4.11-3. For context, linear feet of streams that would be impacted are also shown in both tables. The greatest impacts in areas outside the mine site would occur in the Johnson Creek watershed, with fewer impacts in the other watersheds. Impacts on wetlands due to construction, maintenance, and use of the Burntlog Route would contribute the greatest proportion of direct impacts to wetlands due to access road construction as the width of this route would be approximately four times wider than standard roads in this area. Of the disturbance listed in Tables 4.11-2 and 4.11-3, approximately 50.7 acres would be temporary.

Most indirect effects have not been quantified and it is acknowledged that indirect effects due to changes in hydrology and water quality may lead to wetland and riparian losses beyond estimates in Tables 4.11-2 and 4.11-3 if these indirect impacts do occur. Although not quantified, the amount of additional loss from these mechanisms is expected to be minor (i.e., a change in conditions that would be measurable but slight). For examples, modifications to groundwater and surface water flows are not expected outside the mine area (Forest Service 2022e) while effects on water quality attributable to road usage are expected to be limited by applicable regulation, design features, and BMPs (Forest Service 2022f). Regarding the clearing of tall trees, clearing within 50 feet of the centerline of transmission lines could impact wetlands and riparian areas due to the loss of overstory components. Loss of overstory in forested wetlands could lead to conversion to other wetland types even when reduction in total wetland acreage would not occur. Potential wetland conversion losses due to the clearing of tall trees are included.

**Impacts on Wetland and Riparian Functions**

Impacts to wetland and riparian area functions would occur due to both direct effects (e.g., excavation and fill) and indirect effects such as changes to hydrology, changes to water quality, or dust and/or mercury deposition. Wetland functional units that would be loss due to direct impacts and indirect impacts due to wetland conversion are presented in Table 4.11-4. An estimated total of 1,054.4 wetland functional units would be lost, approximately 375.9 of which would be due to impacts to high value wetlands. Because some of the functional units that would be lost would be due to temporary impacts associated with transmission line construction, the estimated total of functional units that would be lost is greater than reported in the CMP (which only considered permanent effects). Approximately 414.1 of the functional units lost would be temporary. As project design progresses, temporary loss would be better defined. Permanent and temporary losses would constitute a major effect. Functional loss due to other indirect effects, including changes in hydrology, water quality, and increase dust and/or mercury deposition has been examined through inspection of dewatering drawdown and distance to roadways, but is difficult to quantify precisely. As a result, functional units that would be lost if these indirect effects occur, may be underestimated.
<table>
<thead>
<tr>
<th>SGP Component</th>
<th>PEM Wetlands (acres)</th>
<th>PFO Wetlands (acres)</th>
<th>PSS Wetlands (acres)</th>
<th>Open Water (acres)</th>
<th>Total Wetlands (acres)¹</th>
<th>Perennial Streams (feet)</th>
<th>Non-Perennial Streams (feet)</th>
<th>RCAs (acres)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blowout Access Road</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Blowout Borrow</td>
<td>1.4</td>
<td>4.3</td>
<td>6.7</td>
<td>12.3</td>
<td>5,742.4</td>
<td>930.5</td>
<td>40.4</td>
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<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td>0.1</td>
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<td>3.9</td>
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<td>Burntlog Route - Existing</td>
<td>0.3</td>
<td>&lt;0.1</td>
<td></td>
<td>0.3</td>
<td>17.5</td>
<td>1,567.8</td>
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<td>0.3</td>
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<td>391.0</td>
<td>257.4</td>
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<td>&lt;0.1</td>
<td>12.9</td>
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<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>12.9</td>
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<td>1,407.6</td>
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<td>18.6</td>
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<td>328.5</td>
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<td>2.1</td>
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<td>&lt;0.1</td>
<td>0.8</td>
<td>1.2</td>
<td>955.6</td>
<td>812.0</td>
<td>6.3</td>
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<td>1.4</td>
<td>1.5</td>
<td>1,101.5</td>
<td>60.1</td>
<td>5.5</td>
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<td>0.4</td>
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<td>0.5</td>
<td>0.1</td>
<td>1.4</td>
<td>1,737.2</td>
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<tr>
<td>Midnight Diversion</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td></td>
<td>&lt;0.1</td>
<td>189.3</td>
<td>48.1</td>
<td>0.6</td>
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<td></td>
<td></td>
<td></td>
<td>3.1</td>
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<tr>
<td>Plant Diversion</td>
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<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.3</td>
<td></td>
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<td>1.3</td>
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<td>27.7</td>
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<td>0.3</td>
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<tr>
<td>Plant Site Stockpile</td>
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<td>1.0</td>
<td>2.7</td>
<td>711.7</td>
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<tr>
<td>SGP Component</td>
<td>PEM Wetlands (acres)</td>
<td>PFO Wetlands (acres)</td>
<td>PSS Wetlands (acres)</td>
<td>Open Water (acres)</td>
<td>Total Wetlands (acres)</td>
<td>Perennial Streams (feet)</td>
<td>Non-Perennial Streams (feet)</td>
<td>RCAs (acres)</td>
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<td>-----------------------</td>
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<td>0.3</td>
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<td>0.4</td>
<td>2.9</td>
<td>363.9</td>
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<tr>
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<td></td>
<td></td>
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<td>&lt;0.1</td>
<td>352.1</td>
<td>5.9</td>
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<td>&lt;0.1</td>
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<td>PFO Wetlands (acres)</td>
<td>PSS Wetlands (acres)</td>
<td>Open Water (acres)</td>
<td>Total Wetlands (acres)¹</td>
<td>Perennial Streams (feet)</td>
<td>Non-Perennial Streams (feet)</td>
<td>RCAs (acres)²</td>
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<tr>
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Source: AECOM 2020d; Table prepared using wetland delineation data (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2017g, 2017h, Tetra Tech 2021d) and RCA spatial data intersected with SGP components.

¹ Due to rounding, numbers presented in this table may not add up precisely to the totals provided.
² RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.
³ Tall tree clearing was only considered a possible impact to areas where tree species may grow (PFO and PSS wetlands). Information on tree presence in RCAs was not available at the time of analysis and therefore tree clearing in RCAs could not be quantified.

PEM = Palustrine emergent
PFO = Palustrine forested
PSS = Palustrine scrub-shrub
<table>
<thead>
<tr>
<th>SGP Component</th>
<th>PEM Wetlands (acres)</th>
<th>PFO Wetlands (acres)</th>
<th>PSS Wetlands (acres)</th>
<th>Open Water (acres)</th>
<th>Total Wetlands (acres)</th>
<th>Perennial Streams (feet)</th>
<th>Non-Perennial Streams (feet)</th>
<th>RCAs (acres)²</th>
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<td>1.0</td>
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<td>PEM Wetlands (acres)</td>
<td>PFO Wetlands (acres)</td>
<td>PSS Wetlands (acres)</td>
<td>Open Water (acres)</td>
<td>Total Wetlands (acres)¹</td>
<td>Perennial Streams (feet)</td>
<td>Non-Perennial Streams (feet)</td>
<td>RCAs (acres)²</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------</td>
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<td>Transmission Line Structure Removal</td>
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<td>1.2</td>
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<td>Wetland Conversion Losses from Tall Tree Clearing⁴</td>
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<td>6.8</td>
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<td>8.9</td>
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<tr>
<td><strong>Totals¹</strong></td>
<td><strong>39.9</strong></td>
<td><strong>6.2</strong></td>
<td><strong>30.0</strong></td>
<td><strong>0.3</strong></td>
<td><strong>76.3</strong></td>
<td><strong>23,464.2</strong></td>
<td><strong>14,665.8</strong></td>
<td><strong>299.5</strong></td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Table prepared using wetland delineation data (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2017g, 2017h, Tetra Tech 2021d) and RCA spatial data intersected with SGP components.

¹ Due to rounding, numbers presented in this table may not add up precisely to the totals provided.

² RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.

³ Disturbance includes both temporary and permanent effects associated with transmission line construction.

⁴ Tall tree clearing was only considered a possible impact to areas where tree species may grow (PFO and PSS wetlands). Information on tree presence in RCAs was not available at the time of analysis and therefore tree clearing in RCAs could not be quantified.

PEM = Palustrine emergent
PFO = Palustrine forested
PSS = Palustrine scrub-shrub
<table>
<thead>
<tr>
<th>Drainage Basin (HUC 10)</th>
<th>PEM Wetlands (acres)</th>
<th>PFO Wetlands (acres)</th>
<th>PSS Wetlands (acres)</th>
<th>Open Water (acres)</th>
<th>Total Wetlands (acres)</th>
<th>Perennial Streams (feet)</th>
<th>Non-Perennial Streams (feet)</th>
<th>RCA (acres)</th>
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<tr>
<td>Big Creek-North Fork Payette River</td>
<td>8.8</td>
<td>0.7</td>
<td>6.6</td>
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<td>16.1</td>
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<td>2,927.3</td>
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<td>477.5</td>
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<td>Gold Fork River</td>
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<td>1.9</td>
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</tr>
<tr>
<td>Johnson Creek</td>
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<td>26.9</td>
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<td>7,240.3</td>
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<td>626.8</td>
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<tr>
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<td>8.7</td>
<td>5,715.0</td>
<td>3,028.5</td>
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<tr>
<td>Totals1,3</td>
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<td>6.2</td>
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<td>76.3</td>
<td>23,481.7</td>
<td>14,665.8</td>
<td>299.5</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Table prepared using wetland delineation data (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2017g, 2017h, Tetra Tech 2021d) and RCA spatial data intersected with SGP components.

1 Due to rounding, numbers presented in this table may not add up precisely to the totals provided.
2 RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.
3 Disturbance includes both temporary and permanent effects associated with transmission line construction.

PEM = Palustrine emergent
PFO = Palustrine forested
PSS = Palustrine scrub-shrub
### Table 4.11-4  Losses of Wetland Acreages and Functional Units under the 2021 MMP

<table>
<thead>
<tr>
<th>Assessment Area (AA)</th>
<th>AA Number</th>
<th>AA Category</th>
<th>Impacted Wetland Area (acres)</th>
<th>Baseline Function</th>
<th>Impacted Habitat Value (FUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Meadow Creek</td>
<td>1</td>
<td>II</td>
<td>52.2</td>
<td>6.7</td>
<td>349.7</td>
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<tr>
<td>Upper Meadow Creek Seeps</td>
<td>2</td>
<td>II</td>
<td>3.3</td>
<td>5.5</td>
<td>18.2</td>
</tr>
<tr>
<td>Lower Meadow Creek</td>
<td>3</td>
<td>III</td>
<td>33.9</td>
<td>4.5</td>
<td>152.6</td>
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<tr>
<td>Lower Meadow Creek Seeps</td>
<td>4</td>
<td>III</td>
<td>4.3</td>
<td>5.6</td>
<td>24.1</td>
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<tr>
<td>EFMC</td>
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<td>III</td>
<td>0.1</td>
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<td>0.4</td>
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<td>East Fork South Fork Valley</td>
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<td>III</td>
<td>17.1</td>
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<td>95.8</td>
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<tr>
<td>Fiddle Creek</td>
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<td>III</td>
<td>0.9</td>
<td>5.4</td>
<td>4.9</td>
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<td>Hennessy Creek</td>
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<td>Midnight Creek</td>
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<td>3.8</td>
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<td>West End Creek</td>
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<td>0.7</td>
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<td>1.9</td>
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<td>Burntlog</td>
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<td>III</td>
<td>7.7</td>
<td>3.9</td>
<td>30.0</td>
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<td>Riordan Road Alternative and Powerline Corridor³</td>
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<td>6.1</td>
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<td>8.4</td>
<td>4.7</td>
<td>39.4</td>
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<td>Cabin Trout³</td>
<td>14</td>
<td>III</td>
<td>14.7</td>
<td>5.5</td>
<td>80.9</td>
</tr>
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<td>Upper East Fork SFSR</td>
<td>15</td>
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<td>2.7</td>
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<td>III</td>
<td>11.4</td>
<td>5.7</td>
<td>65.0</td>
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<tr>
<td>Transmission Line – Valley³</td>
<td>18</td>
<td>III</td>
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<td>5.0</td>
<td>146.0</td>
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<td>Yellow Pine pit</td>
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<td></td>
<td><strong>196.9</strong></td>
<td>n/a</td>
<td><strong>1,054.4</strong></td>
</tr>
</tbody>
</table>

Source: Tetra Tech (2021c). Refer to Appendix A (Table A-2) for AA-specific information.

1 Wetland categories range from I (highest functional value) to IV (lowest functional value). No Category I wetlands were documented in the analysis area. Category II wetlands are considered high-value for the purposes of this analysis.

2 Functional unit impacts were calculated based on percentage of AA impacted; this calculation assumes equal distribution of functions over the area of a wetland.

3 Disturbance and function units impacted in these AAs includes both temporary and permanent effects associated with transmission line construction.

4 Due to rounding, numbers presented in this table may not add up precisely to the totals provided.

AA = Assessment Area

The magnitude is expected to be greater on roads used for the SGP than would be expected on standard roads due to frequency of travel, size of equipment, and use across seasons. In addition, the Burntlog Route would be near Mud Lake, which is characterized by IDFG as a poor fen (IDFG 2004). Indirect impacts of road improvements and vehicle travel (i.e., increased dust) are likely to impact this fen and degrade its function as habitat for a fen-specific special status plant, Rannoch-rush (*Scheuchzeria palustris*), which is described further in Section 4.10 Vegetation. Although the impact of dust deposition...
has not been quantified, effect magnitude would most likely be minor (small but measurable change) and long-term, limited to the life of the SGP. Effects from changes to hydrology (e.g., construction effects on local drainage and shallow groundwater paths) and water quality could range from negligible to moderate and could be long-term or permanent depending on the actual impact.

Indirect effects to wetland and riparian functions have not been quantified, and although discussed qualitatively, are not represented in impact acreages reported for each action alternative. Regarding dust and/or mercury deposition, SGP construction and operation (particularly road construction and use) could indirectly affect wetlands through increased dust and/or mercury deposition. Potential impacts of dust on vegetation are described in Section 4.10 Vegetation, but in general impacts could alter water quality parameters and inhibit the metabolic processes of plants, which would result in impacts to individuals ranging from mild metabolic inhibition to mortality (Farmer 1993). A reduction in vegetation coverage would result in a loss of wetland and riparian functions as described in the previous paragraph.

**Wetlands and Riparian Area Fragmentation**

The total extent of wetland losses would be approximately 119.8 acres at the mine site and 76.3 acres outside the mine site. Losses of RCAs would occur on approximately 619 acres at the mine site and 300 acres outside the mine site. New roads would bisect 39 total individual wetlands. Fragmentation effects could occur as a result of these impacts.

**Alteration of Wetlands and Riparian Areas Due to Changes in Water Balance**

The 2021 MMP could affect hydrology due to changes in surface water or groundwater inputs. Impacts due to surface water input changes have not been quantified. However, impacts to water balance through groundwater drawdown, which could reduce seasonal water input frequency and duration for on-site and off-site downstream wetlands was estimated based on groundwater modeling. Acres of wetlands in the maximum groundwater drawdown area under the 2021 MMP are presented in Table 4.11-5. These predicted acreages are subject to uncertainties in the numerical groundwater flow predictions. Sensitivity analyses for the extent of groundwater drawdown cones indicated there could be slight changes to the acreages of wetlands in the drawdown area associated with the selection of model parameters (Forest Service 2022e). The entirety of these wetlands also would be subject to direct impacts from SGP component construction, and the acreages presented below are already accounted for in the acreages presented in Table 4.11-1.

**Table 4.11-5  Acres and Types of Wetlands in the Maximum Drawdown Area under the 2021 MMP**

<table>
<thead>
<tr>
<th></th>
<th>PEM Wetland</th>
<th>PFO Wetland</th>
<th>PSS Wetland</th>
<th>Open Water</th>
<th>Total Wetlands¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres of Wetlands</td>
<td>7.2</td>
<td>7.0</td>
<td>28.4</td>
<td>4.2</td>
<td>46.7</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Merged simulated alluvial and bedrock groundwater drawdown contour (maximum drawdown area for all Mine Years combined).

¹ Due to rounding, numbers presented in this table may not add up precisely to the totals provided.

PEM = Palustrine emergent  
PFO = Palustrine forested  
PSS = Palustrine scrub-shrub
Alteration of Wetland and Riparian Areas Due to Change in Water Quality

Changes to water quality parameters would occur under the 2021 MMP during the construction and operation phases. The 2021 MMP would improve some of the existing water quality conditions observed in Meadow Creek and the East Fork SFSR by removing and repurposing legacy mine wastes. However, the 2021 MMP would have direct permanent impacts on water quality, as it would contribute new sources of mine waste material to the East Fork SFSR drainage.

Indirect effects to wetlands and riparian areas could occur under the 2021 MMP if the quantity and or quality of surface and groundwater flows, including the chemical characteristics of the waters, temperature characteristics of waters, change downstream of disturbance areas, and if those changes impact water quality or habitat conditions during active mining and after SGP closure. This could include the effects of placing the TSF and TSF Buttress in stream valleys, which could introduce contaminants or cause temporary changes to pH, temperature, and dissolved oxygen levels. The effects of the SGP on Water Quantity and Water Quality are described in Sections 4.8 and 4.9, respectively.

4.11.2.3 Johnson Creek Route Alternative

Under the Johnson Creek Alternative, the mine site and utilities would be constructed and operated the same as under the 2021 MMP therefore not discussed further below. As a result, impacts to wetlands and riparian areas would be the same in those areas and differences between the two action alternatives would be due to the differences in access routes. The following subsections provide details on the extent of impacts under the Johnson Creek Route Alternative.

Loss of Wetland and Riparian Areas

Off-Site Focus Areas

Acres of impacts to wetlands, RCAs, and streams in the off-site focus area under the Johnson Creek Route Alternative are shown in Table 4.11-6. Impacts to wetlands and riparian areas associated with widening, maintenance, and use of the Johnson Creek Route would be similar to the wetland impacts associated with the Burntlog Route, as described under the 2021 MMP. These include direct loss, fragmentation, and indirect effects such as dust. Wetlands and riparian areas along Johnson Creek are lower in their respective watershed (i.e., farther downstream) as the route is largely located along the East Fork SFSR. Thus, the road impacts would affect wetlands and riparian areas at the confluences of several drainages that feed into the East Fork SFSR, which would have a larger effect on the river. In comparison, the construction of the Burntlog Route described under the 2021 MMP would cross through several drainages but would generally be perpendicular to those waters.

Table 4.11-7 shows acres of impacts to wetlands and RCAs in the off-site focus area by HUC 10 drainage basin (i.e., watershed) under the Johnson Creek Route Alternative. The greatest extent of wetland and riparian impacts in areas outside the mine site would occur in the Johnson Creek watershed, with lesser extents of impacts to wetlands and riparian areas in the other watersheds. Much of the transmission line disturbance would be considered temporary. Of the disturbance listed in Tables 4.11-6 and 4.11-7, approximately 50.7 acres would be temporary.
Impacts on Wetland and Riparian Functions

An estimated total of 1,028.3 wetland functional units would be lost as a result of SGP construction under the Johnson Creek Route Alternative, approximately 370.6 of which would be due to impacts to high-value wetlands (Table 4.11-8). Wetland functional units would be lost due to direct impacts and indirect impacts due to wetland conversion. Because some of the functional units that would be lost would be due to temporary impacts associated with transmission line construction, the estimated total of functional units that would be lost is greater than reported in the CMP (which only considers permanent effects). Approximately 414.1 of the functional units lost would be temporary. As project design progresses, temporary loss would be better defined. The loss of functional units would constitute a major permanent effect. Functional loss due to other indirect effects, including changes in hydrology, water quality, and increase dust and/or mercury deposition has not been quantified. As a result, functional units that would be lost if these indirect effects do occur may be underestimated.

The magnitude of these type of effects are expected to be greater along the Johnson Creek Route than would be expected on standard roads due to frequency of travel, size of equipment, and use across seasons. However, the potential impacts would be less than for the Burntlog Route, as the Johnson Creek Route is not near Mud Lake and would not have impacts on the fen. Although the impact of dust deposition has not been quantified, effect magnitude would most likely be minor (small but measurable change) and long-term, limited to the life of the SGP. Effects from changes to hydrology and water quality could range from negligible to moderate and could be long-term or permanent depending on the actual impact.
### Table 4.11-6  Johnson Creek Route Alternative Impacts to Wetlands, Streams, and RCAs in the Off-site Focus Area

<table>
<thead>
<tr>
<th>SGP Component</th>
<th>PEM Wetlands (acres)</th>
<th>PFO Wetlands (acres)</th>
<th>PSS Wetlands (acres)</th>
<th>Open Water (acres)</th>
<th>Total Wetlands (acres)&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Perennial Streams (feet)</th>
<th>Non-Perennial Streams (feet)</th>
<th>Total RCAs (acres)&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Pine Access Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32.0</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnson Creek Access Road Cut/Fill</td>
<td>0.1</td>
<td>0.1</td>
<td>2.2</td>
<td></td>
<td>2.4</td>
<td>506.4</td>
<td>577.3</td>
<td>87.5</td>
</tr>
<tr>
<td>Stibnite Access Road Cut/Fill</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.1</td>
<td>60.7</td>
<td>2.4</td>
<td>17.3</td>
</tr>
<tr>
<td>Landmark Maintenance Off-Site Facility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.2</td>
</tr>
<tr>
<td>Logistics Off-Site Facility</td>
<td>0.1</td>
<td>0.6</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSV Route</td>
<td>&lt;0.1</td>
<td>0.3</td>
<td>0.3</td>
<td>34.0</td>
<td>163.5</td>
<td>3.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Access Road - Bladed</td>
<td>0.2</td>
<td>&lt;0.1</td>
<td>0.2</td>
<td>245.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Access Road - Major Improvements</td>
<td>0.4</td>
<td>0.3</td>
<td>0.9</td>
<td>1.6</td>
<td>1,337.1</td>
<td>386.7</td>
<td>29.2</td>
<td></td>
</tr>
<tr>
<td>Transmission Line Access Road - Minor Improvements</td>
<td>0.8</td>
<td>0.1</td>
<td>0.4</td>
<td>&lt;0.1</td>
<td>1.3</td>
<td>2,081.1</td>
<td>1,526.4</td>
<td>26.1</td>
</tr>
<tr>
<td>Transmission Line ROW - Existing/Upgrade&lt;sup&gt;3&lt;/sup&gt;</td>
<td>21.5</td>
<td>0.5</td>
<td>14.8</td>
<td>0.2</td>
<td>37.0</td>
<td>14,391.7</td>
<td>6,510.7</td>
<td>131.3</td>
</tr>
<tr>
<td>Transmission Line ROW – New&lt;sup&gt;3&lt;/sup&gt;</td>
<td>2.8</td>
<td>2.0</td>
<td>1.6</td>
<td>&lt;0.1</td>
<td>6.3</td>
<td>1707.2</td>
<td>674.7</td>
<td>14.8</td>
</tr>
<tr>
<td>Transmission Line Pulling and Tensioning Work Area</td>
<td>0.7</td>
<td>0.3</td>
<td></td>
<td>1.0</td>
<td>247.2</td>
<td>856.2</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Transmission Line Staging Work Area</td>
<td></td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td>422.2</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Structure Removal Work Area</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td>422.2</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Structure Work Area</td>
<td>8.3</td>
<td>&lt;0.1</td>
<td>1.2</td>
<td>&lt;0.1</td>
<td>9.6</td>
<td>1,198.1</td>
<td>668.4</td>
<td>15.0</td>
</tr>
<tr>
<td>Wetland Conversion Losses from Tall Tree Clearing&lt;sup&gt;4&lt;/sup&gt; Work Area</td>
<td></td>
<td>2.1</td>
<td>6.8</td>
<td></td>
<td>8.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>36.1</td>
<td>5.1</td>
<td>29.8</td>
<td>0.3</td>
<td>71.2</td>
<td>21,841.0</td>
<td>11,788.5</td>
<td>352.6</td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Table prepared using wetland delineation data (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2017g, 2017h, Tetra Tech 2021d) and RCA spatial data intersected with SGP components.

<sup>1</sup> Due to rounding, numbers presented in this table may not add up precisely to the totals provided.

<sup>2</sup> RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.

<sup>3</sup> Disturbance includes both temporary and permanent effects associated with transmission line construction.

<sup>4</sup> Tall tree clearing was only considered a possible impact to areas where tree species may grow (PFO and PSS wetlands). Information on tree presence in RCAs was not available at the time of analysis and therefore tree clearing in RCAs could not be quantified.

PEM = Palustrine emergent; PFO = Palustrine forested; PSS = Palustrine scrub-shrub
Table 4.11-7  Losses of Wetlands, Streams, and RCAs within the Off-site Focus Area by Watershed under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Drainage Basin (HUC 10)</th>
<th>PEM Wetlands (acres)</th>
<th>PFO Wetlands (acres)</th>
<th>PSS Wetlands (acres)</th>
<th>Open Water (acres)</th>
<th>Total Wetlands (acres)</th>
<th>Perennial Streams (feet)</th>
<th>Non-Perennial Streams (feet)</th>
<th>RCA (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Creek-North Fork Payette River</td>
<td>8.8</td>
<td>0.7</td>
<td>6.6</td>
<td>&lt;0.1</td>
<td>14.3</td>
<td>4,028.6</td>
<td>2,927.3</td>
<td>33.2</td>
</tr>
<tr>
<td>Cascade Reservoir</td>
<td>15.9</td>
<td>&lt;0.1</td>
<td>16.0</td>
<td>218.1</td>
<td>477.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold Fork River</td>
<td>0.9</td>
<td>0.8</td>
<td>0.2</td>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnson Creek</td>
<td>5.7</td>
<td>2.1</td>
<td>13.0</td>
<td>&lt;0.1</td>
<td>17.2</td>
<td>9,902.7</td>
<td>4,264.5</td>
<td>198.3</td>
</tr>
<tr>
<td>Lake Fork-North Fork Payette River</td>
<td>2.2</td>
<td>0.9</td>
<td>2.7</td>
<td>283.1</td>
<td>365.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headwaters East Fork SFSR</td>
<td>1.4</td>
<td>2.2</td>
<td>0.9</td>
<td>3.9</td>
<td>1,711.0</td>
<td>731.9</td>
<td>41.3</td>
<td></td>
</tr>
<tr>
<td>Upper SFSR</td>
<td>1.2</td>
<td>&lt;0.1</td>
<td>7.4</td>
<td>6.5</td>
<td>5,715.0</td>
<td>3,028.5</td>
<td>79.8</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>36.1</strong></td>
<td><strong>5.1</strong></td>
<td><strong>29.8</strong></td>
<td><strong>0.3</strong></td>
<td><strong>71.2</strong></td>
<td><strong>21,858.5</strong></td>
<td><strong>11,795.1</strong></td>
<td><strong>352.6</strong></td>
</tr>
</tbody>
</table>

Source: AECOM 2020d; Table prepared using wetland delineation data (HDR 2013, 2014a, 2014b, 2015a, 2016b, 2017g, 2017h, Tetra Tech 2021d) and RCA spatial data intersected with SGP components.

1 Due to rounding, numbers presented in this table may not add up precisely to the totals provided.
2 RCA acres come from Forest Service RCA data intersected with SGP components (AECOM 2020d). Because the RCA data comes from different data than the stream data and is only applicable to NFS land, RCA acres do not match directly with the stream acres listed.
3 Disturbance includes both temporary and permanent effects associated with transmission line construction.

PEM = Palustrine emergent
PFO = Palustrine forested
PSS = Palustrine scrub-shrub
Table 4.11-8  Losses of Wetland Acreages and Functional Units under the Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Assessment Area (AA)</th>
<th>AA Number</th>
<th>AA Category¹</th>
<th>Impacted Wetland Area (acres)</th>
<th>Baseline Function</th>
<th>Impacted Habitat Value (FUs)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Meadow Creek</td>
<td>1</td>
<td>II</td>
<td>52.2</td>
<td>6.7</td>
<td>349.7</td>
</tr>
<tr>
<td>Upper Meadow Creek Seeps</td>
<td>2</td>
<td>II</td>
<td>3.3</td>
<td>5.5</td>
<td>18.2</td>
</tr>
<tr>
<td>Lower Meadow Creek</td>
<td>3</td>
<td>III</td>
<td>33.9</td>
<td>4.5</td>
<td>152.6</td>
</tr>
<tr>
<td>Lower Meadow Creek Seeps</td>
<td>4</td>
<td>III</td>
<td>4.3</td>
<td>5.6</td>
<td>24.1</td>
</tr>
<tr>
<td>EFMC</td>
<td>5</td>
<td>III</td>
<td>0.1</td>
<td>4.3</td>
<td>0.4</td>
</tr>
<tr>
<td>East Fork South Fork Valley</td>
<td>6</td>
<td>III</td>
<td>17.1</td>
<td>5.6</td>
<td>95.8</td>
</tr>
<tr>
<td>Fiddle Creek</td>
<td>7</td>
<td>III</td>
<td>0.9</td>
<td>5.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Hennessy Creek</td>
<td>8</td>
<td>III</td>
<td>0.4</td>
<td>4.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Midnight Creek</td>
<td>9</td>
<td>III</td>
<td>1.3</td>
<td>2.9</td>
<td>3.8</td>
</tr>
<tr>
<td>West End Creek</td>
<td>10</td>
<td>III</td>
<td>0.7</td>
<td>2.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Burntlog Route</td>
<td>11</td>
<td>III</td>
<td></td>
<td></td>
<td>3.9</td>
</tr>
<tr>
<td>Riordan Road and Powerline Corridor³</td>
<td>12</td>
<td>III</td>
<td>6.1</td>
<td>4.2</td>
<td>25.6</td>
</tr>
<tr>
<td>Johnson Creek Route Alternative³</td>
<td>13</td>
<td>III</td>
<td>8.4</td>
<td>4.7</td>
<td>39.4</td>
</tr>
<tr>
<td>Cabin Trout³</td>
<td>14</td>
<td>III</td>
<td>14.7</td>
<td>5.5</td>
<td>80.9</td>
</tr>
<tr>
<td>Upper East Fork SFSR</td>
<td>15</td>
<td>II</td>
<td>0.4</td>
<td>6.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Stibnite Road Wetlands</td>
<td>16</td>
<td>III</td>
<td>0.9</td>
<td>3.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Transmission Line and Warm Lake³</td>
<td>17</td>
<td>III</td>
<td>11.4</td>
<td>5.7</td>
<td>65.0</td>
</tr>
<tr>
<td>Transmission Line – Valley³</td>
<td>18</td>
<td>III</td>
<td>29.6</td>
<td>5.0</td>
<td>146.5</td>
</tr>
<tr>
<td>Yellow Pine pit</td>
<td>19</td>
<td>IV</td>
<td>4.5</td>
<td>2.6</td>
<td>11.7</td>
</tr>
<tr>
<td>Rabbit Creek Slope Wetlands</td>
<td>20</td>
<td>III</td>
<td></td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Thunder Mountain Road</td>
<td>21</td>
<td>III</td>
<td>&lt;0.1</td>
<td></td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Totals⁴</strong></td>
<td></td>
<td></td>
<td>190.2</td>
<td>n/a</td>
<td>1,028.3</td>
</tr>
</tbody>
</table>

Source: Tetra Tech (2021c). Refer to Appendix A (Table A-3) for AA-specific information.

¹ Wetland categories range from I (highest functional value) to IV (lowest functional value). No Category I wetlands were documented in the analysis area. Category II wetlands are considered high-value for the purposes of this analysis.

² Functional unit impacts were calculated based on percentage of AA impacted; this calculation assumes equal distribution of functions over the area of a wetland.

³ Disturbance and function units impacted in these AAs includes both temporary and permanent effects associated with transmission line construction.

⁴ Due to rounding, numbers presented in this table may not add up precisely to the totals provided.

AA = Assessment Area
**Wetland and Riparian Area Fragmentation**

Under the Johnson Creek Route Alternative, the total extent of wetland losses would be approximately 119.8 acres at the mine site and 71.2 acres outside the mine site. Losses of RCAs would occur on approximately 618.9 acres at the mine site and 353 acres outside the mine site. New roads would bisect six total individual wetlands. Fragmentation effects could occur as a result of these impacts.

**Alteration of Wetland and Riparian Areas Due to Change in Water Balance**

Impacts of altered hydrology, including groundwater drawdown, would be the same as described under the 2021 MMP.

**Alteration of Wetland and Riparian Areas Due to Change in Water Quality**

Impacts of altered water quality would be the same as described under the 2021 MMP.

### 4.11.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis.

In order for the USACE to issue a permit under Section 404 of the CWA and authorize dredge or fill placement in WOTUS, all unavoidable impacts to jurisdictional WOTUS must be mitigated. The final rule for Compensatory Mitigation for Losses of Aquatic Resources (U.S. Environmental Protection Agency and USACE 2008) states a preference for achieving mitigation by first trying to find available wetland mitigation credits from an agency-approved wetland mitigation bank. When mitigation bank credits are not available, the final rule directs 404 permit applicants to seek out opportunities to use in-lieu fee programs to satisfy mitigation needs. In-lieu fee programs are generally operated by public resource agencies that accept money for wetland impacts within a specific geography and periodically use that money to fund wetland restoration, creation, or enhancement projects within that same geography.

Perpetua proposes to accomplish compensatory mitigation for impacts to wetlands through a combination of mitigation bank credits in the North Fork Payette subbasin and permittee-responsible on-site mitigation within the SFSR subbasin (Tetra Tech 2021b).

The two action alternatives include activities that would result in permanent impacts to WOTUS including wetlands. Therefore, Perpetua would need to submit and gain approval for a final compensatory wetland mitigation plan, and then implement and maintain the planned wetlands in coordination with the USACE, as part of their CWA 404 permit. Without this permit, work in WOTUS cannot legally commence. A CMP (Tetra Tech 2021b) that addresses compensation for lost wetland areas and functions has been provided by Perpetua. The CMP addresses compensatory mitigation for the permanent impacts described in this EIS, which would be accomplished through a combination of mitigation bank credits and the creation of new wetlands and enhancing and reclaiming existing wetlands in the general vicinity of the impact areas. The CMP also addresses compensatory mitigation to reduce the temporal loss of aquatic functions and potential risks associated with actions described in the CMP. Temporal loss of functions and values is discussed further below.
The current CMP describes an accounting process for tracking the various wetland impacts (losses) and associated wetland mitigation (gains). The CMP uses the MWAM functional assessment tool to determine functional units for each affected wetland assessment area. These units are based on a combination of MWAM scores and acres of wetlands. When these functional units would be lost due to development in the associated wetland those losses are considered “debits.” Conversely, the creation of new wetlands can result in “credits” by assessing and estimating the predicted functional scores and area of proposed wetlands that would be created, restored, or enhanced. Using this system of accounting for wetland credits and debits, the CMP provides a ledger that itemizes debits throughout the construction and operating phases and proposed credits for conceptual wetland creation actions. This system of accounting for losses and compensatory gains is intended to demonstrate a means of ensuring that adequate mitigation would be provided regardless of the final impact area/selected action alternative. The ledger can be scaled up or down to identify the appropriate wetland credits needed to compensate for the final determination of wetland debits, which would be documented in the CWA 404 permit. The ledger system also provides a way to track and assess temporal effects, which as described in Section 4.11.2 are the effects that come from the loss of wetland functions during the period between impacts and compensatory mitigation.

Based on the CMP ledger of debits and credits, the amount of time associated with the temporal impacts related to wetlands is approximately 20 years, during which time as many as 576 functional units are outstanding (Tetra Tech 2021c). These temporal effects would only occur within the Salmon River Drainage because effects within the Payette River Drainage would be mitigated via mitigation bank credits. Coordination with the USACE for approval of existing and predicted wetland functional assessment scores is ongoing and may also result in changes relative to the totals listed in this section. Wetland baseline functions may be revised in a way that results in a change to baseline functional scores. Final impact acreages would be determined as part of the CWA Section 404 permit application and would be agreed upon by the USACE.

The current CMP describes a plan to locate the compensatory wetland mitigation sites within the same subbasins as the associated wetland impact sites. However, although the proposed compensatory wetland mitigation sites would be within the subbasins where impacts occur, they would all be located around the mine site area where the majority of wetland impacts would occur, with no mitigation sites proposed along the access roads and the transmission line routes. The current location and configuration of mitigation sites identified in the CMP were selected based on suitable hydrology and compatibility with watershed-scale features and on the likelihood that compensatory mitigation wetlands would be sustainable within 5 years (Tetra Tech 2021b). At the conclusion of the Forest Service process, final wetland impacts would be assessed, any agreed upon off-site compensatory mitigation projects would be finalized, and a final mitigation plan would be prepared, including a final assessment of functional units lost and created, and then the final credits/debits would be documented in an application for CWA Section 404 permit.
4.11.4 Irreversible and Irretrievable Commitments of Public Resources

4.11.4.1 No Action Alternative

Under the No Action alternative there would be no irreversible or irretrievable commitment of wetlands or riparian areas associated with the SGP.

4.11.4.2 Action Alternatives

The loss of the wetland and riparian acres and their functions as a result of the SGP would be irreversible in their original locations. However, compensatory wetland mitigation would allow for the extent and functions of lost wetlands to be reestablished in other locations. These impacts would be less under the Johnson Creek Route Alternative due to the Burntlog Route not being built.

4.11.5 Short-term Uses versus Long-term Productivity

4.11.5.1 No Action Alternative

The No Action Alternative would not affect the short-term use or long-term productivity of wetlands or riparian areas in the analysis area.

4.11.5.2 Action Alternatives

Short-term uses of wetland and riparian resources for construction and operation of the SGP would impact the long-term productivity of these resources. Construction and operation of the mine site would permanently fill more than 119 acres of wetlands under the Action Alternatives, resulting in a permanent loss of wetland functions and loss of long-term productivity of this resource. Compensatory mitigation would be implemented to ensure no net loss of wetland functions; however, some long-term wetland productivity loss would still occur. The time required for revegetated wetlands to return to their pre-impact functionality, or for compensatory wetlands to achieve functionality, would depend on the current condition and physical characteristics of each wetland. In general, organic soils would take much longer to return relative to mineral soils (particularly alluvial soils); forested wetland vegetation would take much longer to return relative to herbaceous vegetation; and vegetation in higher elevations would take longer to return relative to lower elevations where growing seasons are longer.

Long-term impacts on wetland productivity also could result from indirect impacts on wetlands adjacent to the mine site or new/improved access roads. Fragmentation, disruption of wetland hydrologic inputs, and changes to vegetation composition would reduce the functional capacity of remaining wetlands, which would permanently reduce wetland productivity in the area.

Construction and operation of the mine could affect long-term wetland and riparian productivity by increasing sedimentation from erosion and increasing the amount of pollutants and fine-grained sediments delivered to receiving waters (including wetlands) via surface water runoff. Mitigation measures required by both the Forest Service and the USACE are expected to reduce the amount of sedimentation-caused wetland impacts. The USACE is working with Perpetua to address wetland impacts through compensatory mitigation.
4.12 Fish Resources and Fish Habitat

4.12.1 Impact Definitions and Effects Analysis Indicators and Methodology

Construction and operation of mine infrastructure may impact the quality and quantity of water, and habitat for Chinook salmon, steelhead, bull trout, and westslope cutthroat trout. Project activities may also affect fish behavior and reproductive success and may result in injury or mortality of Chinook salmon, steelhead, bull trout, and westslope cutthroat trout in the analysis area.

The analysis of effects on Fisheries and Aquatic Habitat includes the following identified issues and indicators:

**Issue:** The SGP may cause changes in aquatic habitat in the analysis area that may affect aquatic species, including federally listed fish species and aquatic habitat (e.g., designated Critical Habitat) and Management Indicator Species within and downstream of the SGP area.

**Indicators:**

- Changes in water chemistry.
- Change in stream flow.
- Change in length of stream and lake habitat directly impacted by channel removal.
- Changes in water temperature (degrees Celsius [°C]).
- Change in amount of total useable Chinook salmon IP habitat.
- Loss of Chinook salmon Critical Habitat.
- Change in total useable steelhead IP habitat.
- Change in length of bull trout habitat.
- Change in bull trout occupancy probability.
- Change in access to bull trout lake habitat.
- Loss of bull trout Critical Habitat.
- Change in length of westslope cutthroat trout habitat (km)
- Change in westslope cutthroat trout occupancy probability
- Changes in stream peak and baseflow (cfs).

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1.1.

The analysis area for fish and aquatic habitat includes the area where effects (direct/indirect and cumulative) may be caused by the proposed activities (FSH.1909.15, 15.2a). Alternative components include the mine site, all associated mine support infrastructure, all access and haul roads (proposed and existing), all utility infrastructure (proposed and upgraded), and off-site facilities.

A summary of the available data was compiled for specific watersheds/subwatersheds and individual species (Chinook salmon, steelhead trout, bull trout, and westslope cutthroat trout). Data was obtained and modeled using various sources and consisted of different metrics, such WCIs. The information used to describe the existing condition of fish and fish habitat in the analysis area was gathered from numerous
sources, including federal and state resource agencies, the Nez Perce Tribe, and Perpetua. AECOM 2020a provides a list of fish and stream habitat data collected in the analysis area between 1991 and 2019 (Table 4.12-1).

To further describe the existing condition of habitat in the analysis area for special status fish species, additional modeling was performed and the studies and outcomes are described in technical memoranda (ESS 2019a, 2019b, 2019c, 2019d, 2019e, 2019f, 2019g, 2019h, AECOM 2020a, 2020b) and the SGP Fisheries and Aquatic Habitat Specialist Report (Forest Service 2022i).

### 4.12.2 Direct and Indirect Effects

Direct and indirect effects described in this section are considered to be negative unless explicitly described as beneficial.

To analyze impacts on fish resources and aquatic habitat the following assumptions were made:

- The proposed East Fork SFSR fish tunnel under the 2021 MMP would provide passage for all four special status fish species. This assumption is based on professional judgment and review of other similar or longer tunnels that have been documented to be fish passable (Gowans et al. 2003; Rogers and Cane 1979; Wollebaek et al. 2011). This analysis also includes a brief description of the effects if the tunnel does not provide passage as planned (USFWS 2019b).

- The constructed and enhanced stream reaches would perform as described in the Stream Design Report (Rio ASE 2021).

- The stream temperature analysis is based on the duration of SGP phases as: construction – 3 years; mining – 15 years; closure and reclamation – 5 years; and post-closure to Mine Year 112.

- The stream flow analysis within the combined stream and pit water temperature models (SPLNT models, Brown and Caldwell 2018b, 2021e, 2021i) accurately reflect future conditions, which is based on historic conditions.

Much of the aquatic habitat modeling and analysis presented in this section is based on the hydrologic and site-wide water chemistry modeling performed by Perpetua or its consultants. Predictions generated by groundwater and hydrologic models (Brown and Caldwell 2021e) are associated with a degree of uncertainty and can be limited in their predictive ability (see Sections 4.8.2.4, 4.9.2.4, and the uncertainty sections of Forest Service 2022e, 2022f).
<table>
<thead>
<tr>
<th>Data Source</th>
<th>Project/Study</th>
<th>Location</th>
<th>Data Years</th>
<th>Available Data</th>
<th>Data Collection Methods</th>
<th>Species Information</th>
<th>Reference</th>
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<tr>
<td>Boise National Forest</td>
<td>Boise National Forest Aquatic Database</td>
<td>Analysis area and vicinity</td>
<td>1991-2016</td>
<td>Habitat, fish community</td>
<td>Electrofishing, snorkel, eDNA, PIBO and other stream habitat surveys</td>
<td>Chinook salmon, bull trout, westslope cutthroat trout, <em>Oncorhynchus mykiss</em></td>
<td>BNF 2017</td>
</tr>
<tr>
<td>GeoEngineers</td>
<td>Aquatic Resources 2016 Baseline Study Addendum Report</td>
<td>Mine site Study Area</td>
<td>2015</td>
<td>Fish community, population estimates</td>
<td>Electrofishing/mark-recapture surveys</td>
<td>Chinook salmon, bull trout, westslope cutthroat trout, <em>Oncorhynchus mykiss</em></td>
<td>GeoEngineers 2017</td>
</tr>
<tr>
<td>Great Ecology</td>
<td>Supplemental Stream and Wetland Baseline Data Report for the Stibnite Gold Project</td>
<td>Mine site Study Area, as well as access roads</td>
<td>2018</td>
<td>Habitat</td>
<td>Stream habitat surveys</td>
<td>Habitat data only</td>
<td>Great Ecology 2018</td>
</tr>
<tr>
<td>HDR</td>
<td>Stream Functional Assessment</td>
<td>Mine site Study Area</td>
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<td>Habitat</td>
<td>Stream habitat surveys</td>
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<td>HDR 2016c</td>
</tr>
<tr>
<td>MWH</td>
<td>Aquatic Resources 2016 Baseline Study</td>
<td>Mine site Study Area</td>
<td>2012-2016</td>
<td>Habitat, fish community, macroinvertebrates, fish tissue</td>
<td>Electrofishing, snorkel, eDNA, PIBO and other stream habitat surveys</td>
<td>Chinook salmon, bull trout, westslope cutthroat trout, <em>Oncorhynchus mykiss</em></td>
<td>MWH 2017</td>
</tr>
<tr>
<td>Data Source</td>
<td>Project/Study</td>
<td>Location</td>
<td>Data Years</td>
<td>Available Data</td>
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<td>Species Information</td>
<td>Reference</td>
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<tr>
<td>Nez Perce Tribe</td>
<td>Chinook and Bull Trout Redd Count Data</td>
<td>Johnson Creek, Burntlog Creek, East Fork SFSR, and tributaries, including Meadow Creek</td>
<td>1998-2018</td>
<td>GIS data on redd counts</td>
<td>Spawning ground survey</td>
<td>Chinook salmon and bull trout</td>
<td>Nez Perce Tribe 2018</td>
</tr>
<tr>
<td>Stantec</td>
<td>Aquatic Resources Baseline Study Tech Memos</td>
<td>Mine site Study Area, as well as access roads and control sites</td>
<td>2017-2019</td>
<td>Habitat and fish community</td>
<td>Stream habitat and eDNA surveys</td>
<td>Chinook salmon, bull trout, westslope cutthroat trout, <em>Oncorhynchus mykiss</em></td>
<td>Stantec 2018, 2019, 2020</td>
</tr>
</tbody>
</table>

Source: AECOM 2020a

1. Available data: stream habitat (e.g., habitat unit, riparian habitat, PIBO methodology, substrate type, water temperature, water velocity), fish community (e.g., eDNA, presence/absence, redd counts, juvenile density), tissue residues (metals), population estimates, etc.
2. Data collection methods applied (e.g., fish surveys, weir counts, spawning ground surveys, stream habitat surveys (e.g., PIBO).
Several assumptions regarding physical, biological, and chemical conditions were made to address incomplete information at the time of this analysis.

- Reach-specific fish spatial distribution (i.e., presence/absence) data were not available for all streams potentially affected by the action alternatives, especially the streams outside the mine site. Population estimates were not available; as described in the Aquatic Resources 2016 Baseline Study Report Addendum (GeoEngineers 2017), the results of the multiple years of diver-based snorkel surveys are limited and variable.

- Some habitat conditions could not be quantitatively evaluated due to a lack of available data or a suitable site-specific model (e.g., impacts of stream flow reductions on overwintering fish, and a site-specific stream flow/productivity model). Other examples include lack of modeling of existing habitat for many fish at multiple life stages. There is a lack of a site-specific, two-dimensional hydraulic-based habitat suitability model. The nearest sites where data have been collected and modeling performed are on several streams in the Upper East Fork of the Salmon River (Sugar Creek, Tamarack Creek, Profile Creek, Quartz Creek, and the East Fork SFSR).

4.12.2.1 No Action Alternative

Under the No Action Alternative, the Forest Service would not approve the SGP, and therefore no activities proposed on Forest Service lands would be approved. Under the No Action Alternative, there would be no surface (open-pit) mining or ore processing to extract gold, silver, and antimony, and no underground exploration or sampling or related operations and facilities on NFS lands. Perpetua could continue to conduct surface exploration that has been previously approved. Perpetua would continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations (Midas Gold 2016b). These commitments include reclamation of the drill pads and temporary roads and monitoring to ensure that BMPs are in place and effective so that soil erosion and other potential resource impacts are avoided or minimized. This also would include monitoring commitments required by the Forest Service relating to the Golden Meadows Exploration EA (Forest Service 2015c).

Current authorized uses by Perpetua on patented mine/mill site claims, and on PNF and BNF would continue. Uses of NFS lands include mineral exploration, dispersed and developed recreation, such as pleasure driving, hunting, off-highway-vehicle use, camping, hiking, snowmobiling, bird watching, target shooting, firewood cutting, and other forms of recreation. Private businesses, such as outfitter and guide services, also operate on the Forest through special use permits. Access to public land in the area would continue as governed by law, regulation, policy, and existing and future landownership constraints, the latter of which may include denial of access over private land.

Under the No Action Alternative there would be no SGP-caused impacts on physical stream channels, WCIs, individual fish (including federally listed and forest service species sensitive species), or fish habitat.
4.12.2.2 2021 MMP

The descriptions of effects are organized as follows: direct impact-causing activities (i.e., physical stream channel changes) and the Direct Effects to Individuals section, are discussed first because those activities would have the greatest potential to impact fish and aquatic habitat at the mine site. Habitat changes are described next (Watershed Condition Indicators/Habitat Elements) and separated into two subsections (mine site and off-site). This is followed by more detailed descriptions of impacts to each of the four main species (Chinook salmon, steelhead trout, bull trout, and westslope cutthroat trout).

Direct and Indirect Impacts to Individuals

The following analysis of effects associated with fish resources and aquatic habitat is considered within the overall context that resident and anadromous fish species could be affected, including three species listed as threatened under the ESA, and one Forest Service sensitive species. While these listed and sensitive species are the focus of the analyses, the effects described are expected to be similar for all fish species in the analysis area.

Dewatering, Fish Salvage, Relocation

Dewatering, fish salvage, and relocation may be necessary for culvert replacement, new culvert installation, and potentially for bridge maintenance, and could cause injury or mortality to fish in the immediate vicinity or during relocation activities if required. The standard procedures to be developed for dewatering at the mine site also would be used for activities in all other SGP areas (Brown and Caldwell, McMillen Jacobs, and BioAnalysts, 2021b); therefore, the number of injuries or mortalities is expected to be minimized. Approximately 71 water crossings would be required for access roads, and a number of these would cross fish-bearing waterbodies. Fish salvage would be required for dewatering and all in-water work at stream crossings in all fish-bearing water bodies and fish impacts would be limited to minor (less than 10 percent) incidental take associated with fish salvage. Fish salvage work would require prior state and federal agency consultations and would follow USFWS Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards (USFWS 2012). Dewatering and in-water work at stream crossings would be spatially limited relative to the larger-scale work occurring in the active mine area. Therefore, effects of the SGP on fish would be negligible, temporary, and localized.

Fish salvage and relocation would be conducted prior to stream channel dewatering due to mining, construction, restoration, road crossing maintenance, or other activities. Brown and Caldwell, McMillen Jacobs, and BioAnalysts, 2021b outlines the sequence for fish salvage work including site preparation, work area isolation, fish capture, fish handling, and fish relocation. Dewatering would impact streams including East Fork SFSR upstream from Yellow Pine pit lake, East Fork SFSR downstream from Yellow Pine pit lake, Fiddle Creek, Meadow Creek and tributaries, and EFMC. In total, 17.11 km of stream channel are estimated to be subject to dewatering and fish salvage. In some cases, reaches would be dewatered, and fish salvaged, more than once. Fish salvage would prevent population-level impacts to fish within the active mine area but result in some incidental mortality (generally less than 10 percent), and have a moderate, localized, long-term impact on all fish species within the study area. Additional information on the rescue and relocation protocols and implementation is provided in the Fisheries and Aquatic Resources Mitigation Plan (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021b).
Salvage and relocation of fish from the Yellow Pine pit lake (19,267 square meters) would require a larger and longer effort than fish salvage in dewatered stream reaches. However, impacts to fish species present and incidental mortality are expected to be similar. A fish barrier would be installed and designed to allow fish to leave the Yellow Pine pit lake but not allow fish to migrate upstream. The purpose of the barrier would be to ensure that the fewest number of individual ESA-listed fish species are present in the Yellow Pine pit lake when the draining process begins. The upstream fish barrier would be in place in advance of the completion of the East Fork SFSR tunnel and diversion of the East Fork SFSR into the tunnel to minimize fish abundance in the lake prior to dewatering (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021b). In other respects, dewatering and fish salvage in the Yellow Pine pit lake would be similar to other areas of the SGP with prior agency consultation, less than 10 percent mortality, and following USFWS Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards (USFWS 2012). Dewatering and associated fish salvage in the Yellow Pine pit lake would have a moderate, localized, long-term impact on all fish species within the study area.

**Noise and Vibration**

*Access Roads, Utilities, and Offsite Facilities*

Blasting would occur during construction of portions of the Burntlog Route and the new transmission line. Explosives would also be used to fracture rock from mine operations. Blasting can cause serious injury or mortality to fish; however, these activities would follow applicable regulations and standards (described in more detail below). Therefore, negligible, temporary, and localized effects to fish or fish habitat are expected from blasting along portions of the Burntlog Route.

*Operations*

Explosives would be used to fracture rock from mine operations. Explosives detonated near water produce shock waves that may be lethal or damaging to fish, fish eggs, or other aquatic organisms. Outside of the zone of lethal or harmful shock waves, the vibrations caused by drilling and blasting have the potential to disturb fish causing stress or altering behavior. Most of the blasting required at the mine site would be in and near the Yellow Pine, Hangar Flats, and West End pits, with some that may be required for construction of stream diversions at the TSF, YPP, and TSF Buttress. Such blasting would generally occur on hillsides and at higher elevations, with considerable distance between streams and the origin of the blasts. Blasting and drilling activities near fish-bearing streams have the potential to affect fish by producing hydrostatic pressure waves, and create underwater noise and vibration, thereby temporarily altering in-stream conditions. Effects on fish from changes in hydrostatic pressure are not related to the distance of the fish from the point of impact, but to the level and duration of the sound exposure (Hastings and Popper 2005).

In order to avoid injury, instantaneous sound levels should be less than 206 peak dB and extended time should be less than 187 dB (183 dB for fish less than 2 grams) sound exposure level, referenced at 1 micropascal (re 1 µPa) for sound traveling through water, measured at a distance of 10 meters (Fisheries Hydroacoustic Working Group 2008).

In addition to sound effects, excessive ground vibrations have the potential to affect fish, particularly the sensitive egg life stage (Timothy 2013, Kolden and Aimone-Martin 2013). Smirnov (1954, as cited in
Alaska Department of Fish and Game (1991) found significant egg mortality caused by ground vibrations with a peak particle velocity (PPV) of 2 inches per second (ips). Jensen and Collins (2003) found that a PPV of 5.8 ips resulted in 10 percent mortality of Chinook salmon embryos. Faulkner et al. (2008) found that PPVs up to 9.7 ips resulted in significantly higher mortality in *O. mykiss* eggs but there was no increase in mortality when exposed to PPVs of 5.2 or less. The Alaska Department of Fish and Game have PPV restrictions of 2.0 ips to protect salmonids (Timothy 2013). The reported PPV value for an in situ soil sampling rig at a distance of 100 feet is 0.011 ips (ATS Consulting 2013).

Safe setback distances for blasting in or near water for the protection of fish have been established (Dunlap 2009; Kolden and Aimone-Martin 2013; Timothy 2013; Wright and Hopky 1998). Perpetua (2021a) has committed to comply with blasting standards set forth in Wright and Hopky (1998), and Timothy (2013). These standards have been shown to minimize the risk of injury or mortality to all life stages of fish.

As part of the SGP EMMP, an Explosives and Blasting Management Plan would be developed that would ensure compliance with the blasting requirements of the MSHA, 30 CFR 56, Subpart E – Explosives and 30 CFR 57, Subpart E – Explosives. The blasting plan would include the setback distances and other BMPs.

A spreadsheet tool was developed to compute the required setback distances from fish-bearing streams and lakes (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021b). The results indicate that a 425-foot blasting setback from the closest point in the blast field to stream and lake habitats should be protective in most cases, assuming a 40-foot bench height. These findings were used to examine likely areas where blasting would be near streams or lakes. For a 20-foot bench height, the examination indicated that a 239-foot blasting setback could be met everywhere within the mine plan. Considering a 40-foot bench, blasts may encroach on the 425-foot blasting setback in limited areas adjacent to the Yellow Pine pit lake near the East Fork SFSR tunnel and adjacent to the Hangar Flats pit where Meadow Creek is closest to the pit. In those areas where blasting is nearer to streams and lakes and impacts may occur, it is possible that the bench heights could be adjusted to 20 feet, reducing the required setback.

In addition to protective setbacks and bench height, Perpetua may employ other methods when warranted, such as using controlled blasting techniques following industry BMPs, modifying blasting variables including charge size, and vibration and overpressure monitoring.

Because all blasting would be conducted in compliance with applicable regulations and standards (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021b), the noise and vibration effects of the SGP to fish are expected to be negligible, long-term, and localized. Little to no effects is expected to fish or aquatic habitat from blasting along portions of the Burntlog Route and transmission line.

**Spill Risk**

There is the potential for spills to occur along access roads as fuel and other materials are trucked to and from the SGP during construction of the access roads and mine facilities (see also Section 4.7.2.2). If a spill were to occur at a stream crossing or near a stream, surface water could be impacted. Although not all waterbodies crossed via culvert are fish-bearing, spills into any waterway could travel downstream to fish-bearing waters.
Overall, design features (Section 2.4.9) and permit stipulations and regulatory requirements from state and federal agencies would reduce the risk of spills and ensure that effective response is provided should a spill occur.

Mine transport begins on Warm Lake Road (CR 10-579) where the risk of spills would be lower, as it is paved and maintained by Valley County and has overall gentler grades. At the intersection of Warm Lake Road and Johnson Creek Road (CR 10-413) the two mine access routes begin, with the Johnson Creek Route north along Johnson Creek Road (CR 10-413) and the Burntlog Route east onto Burnt Log Road (FR 447). The location of the spill risk would change as the SGP progresses under the 2021 MMP. Johnson Creek and the portion of the East Fork SFSR between the village of Yellow Pine and the Operations Area Boundary would be at risk of any significant spills of hazardous materials during the first 1 to 2 years of the SGP when the Johnson Creek Route would be used as the access route during the Burntlog Route construction. For the remainder of the mine life, the waterbodies along the Burntlog Route would be at risk from any significant spills.

The combination of the proposed monitoring, planning, and control practices described in the preceding narrative for transport and handling of fuels and hazardous materials and committed EDFs would minimize the risk of accidental releases during the transportation, storage, management, and use of hazardous materials. Nevertheless, the proximity of the access roads to surface water resources increases the potential for a release to enter water which could result in major impacts.

It is expected that the risk of a spill large enough to negatively affect fish or aquatic habitat would be low, but the risk occurs throughout the period of the operations. The effects of the SGP on fish and aquatic habitat from contaminants from a spill are expected to be minor, long-term, and localized.

Altered Physical Stream Structure

The SGP would result in stream channel changes, including dewatering, restoration, and enhancements within the active mine area (Figure 4.12-1). Physical alterations to stream structure from the SGP that would result in impacts to fish generally fall into three phased categories construction, active mining, and reclamation and restoration.

Construction and operation under the 2021 MMP would eliminate the existing Yellow Pine pit lake, and important bull trout rearing/feeding habitat, and stream reaches currently occupied by Chinook salmon, steelhead, bull trout, and westslope cutthroat trout. The Yellow Pine pit lake would be replaced with a lake feature called Stibnite Lake which would be designed to serve similar functions to the existing Yellow Pine pit lake including lentic fish rearing/feeding habitat and temperature buffering (Rio ASE 2021). Relative to baseline conditions, construction during the active life of the mine would result in a maximum of 4 percent loss of stream channel habitat upstream from the Sugar Creek confluence occurring by Mine Year 12 based on total estimated stream length (Rio ASE 2021). Reclamation and restoration starting in the active mining period and continuing post-closure would result in a 4 percent increase in total channel habitat length relative to baseline conditions. Specific stream channel restoration plans are discussed in the Stibnite Gold Stream Design Report (Rio ASE 2021).
The construction and operation of the East Fork SFSR fishway would allow any fish passing through the fishway to access upstream areas thereby limiting the overall fish population impact of habitat reduction in the area of the active mine for a period of approximately 12 years. The fishway would serve to reduce the overall impacts of dewatering the diversion, and stream channel elimination in the active mine. Protective measures, such as routing stream flow around construction areas or during stream restoration activities would be implemented to protect water quality (see the SGP Fisheries and Aquatic Habitat Specialist Report for additional details, Forest Service 2022i).

Changes in age structure, habitat use, productivity, and species composition would occur within the study area during the period of active mining due to extensive physical stream structure changes (Figure 4.12-1). However, the spatial extent and magnitude of these changes would be reduced by fisheries protection measures such as the East Fork SFSR fishway. By Mine Year 11, the fishway would be replaced with an open channel through which volitional passage could occur. Incremental improvements in fish passage and habitat quality would occur through the restoration process leading to an improved permanent condition relative to baseline as described below.

Restoration of stream and lake habitats and riparian vegetation within the active mine area after reclamation would result in a net increase in stream length and accessible fish habitat post-closure relative to baseline conditions and volitional fish access to habitats upstream of the Yellow Pine pit lake (Rio ASE 2021). The Stibnite Lake would provide lentic rearing habitat within the mine area for bull trout and other species without impeding upstream passage. During the 12-year period in which the Yellow Pine pit lake is unavailable and before the Stibnite Lake is created, bull trout would not have access in the mine area to lake habitat, an important habitat for the adfluvial bull trout. This would result in a major, long-term, localized impact to bull trout.

Stream enhancements in the East Fork SFSR and lower Meadow Creek would include improvements to physical channel processes and habitat largely within the existing stream channel. This would be accomplished by selectively installing large woody debris and rock structures, creating pools, enabling improved sediment sorting, and generally increasing hydraulic and habitat diversity. Enhancement efforts also may include floodplain reconnection and establishment of riparian vegetation, achieved by excavation of legacy fill material down to bankfull level (Rio ASE 2021).

The Fisheries and Aquatic Resource Mitigation Plan and the FOMP (Brown and Caldwell, McMillen Jacobs, and BioAnalysts 2021a and 2021b) describe in detail how impacts to fish populations within the SGP would be mitigated through fish salvage/rescue in dewatered channels, minimizing runoff impacts, use of fish screens to prevent entrainment, and operation of the East Fork SFSR fishway or trap and truck alternatives.

The effects of the 2021 MMP construction activities would have a major, short-term, localized impact on Chinook salmon, steelhead, bull trout, and westslope cutthroat trout. The restoration activities, particularly providing volitional passage in the East Fork SFSR, would result in a major, permanent, regional, and beneficial effect on Chinook salmon, steelhead, bull trout, and westslope cutthroat trout within the vicinity of the mine.
Figure 4.12-1
Stream Channel Changes During Construction, Active Mining, and Reclamation/Restoration Phases
Stibnite Gold Project
Stibnite, ID

LEGEND

Project Components*
SGP Features
- Post-Closure Perennial Restored Stream **
- Non-fish-bearing Stream

Stibnite Lake

Public Access Road ***

Other Features
- U.S. Forest Service
- Wilderness
- Monumental Summit

Surface Land Management
- Private
- U.S. Forest Service

* Project Components are associated with all Alternatives
** Perennial streams are not depicted for the entire map area. Only perennial streams within the Operations Area Boundary are depicted.
*** Public Access Road associated with 2021 MMP

Base Layer: Hillshade derived from LiDAR supplied by Mosaic Gold
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); Boise National Forest; Payette National Forest

1 inch = 0.5 miles when printed at 11x17
Impacts to Watershed Condition Indicators/Aquatic Habitat Elements

Water Temperature

Predicted future temperature increases resulting from the 2021 MMP were evaluated using a SPLNT model (Brown and Caldwell 2021i) which calculated a MWMT for SGP area stream segments (see also Section 4.9.2.3).

The fish species of greatest management concern considered in this analysis that would be impacted by the SGP are all salmonids that are adapted to a cold-water thermal regime, requiring the species life stages, they may be impaired or their survivability decreases.

A summary of predicted water temperatures under the 2021 MMP are presented in Table 4.12-2. The periods evaluated include the baseline conditions, those within the mine operations (Mine Years 6, 12, and 18), one within the closure and reclamation period (Mine Year 22), and several in the post-closure period (Mine Years 27, 32, 52, and 112). The post-closure period represents how the mine site would function after the facilities and permitted discharges have been removed, dewatering and mining have been discontinued, and the channels and vegetation have been fully reclaimed.

The SPLNT model used for the temperature predictions in Table 4.12-2 does not account for changes to stream temperatures caused by changing climate conditions. This means that modeled future water temperatures (e.g., Mine Year 112) assumed that without the 2021 MMP, stream temperatures would be similar to the historic water temperature data (Brown and Caldwell 2018b). Water temperatures would likely be higher if climate change had been incorporated into the model. Climate change would be expected to increase water temperatures from baseline estimates to the end of the mine operations by as much as 0.1°C to 2.0°C based on forecasts for 2030-2059 (Isaak et al. 2016). This range of expected temperature increase attributable to climate change is based on a forecast period approximately 75 years shorter than the model predictions through Mine Year 112. Due to the potential effects of climate change and other uncertainties in stream water temperatures over the long-term such as effects of stream restoration and riparian shading, later year model predictions have more uncertainty than earlier year model predictions. This uncertainty is discussed further in the sensitivity analysis section of Brown and Caldwell 2018b and the uncertainty analysis section of Forest Service 2022f.

In the East Fork SFSR upstream from Meadow Creek, water temperatures tend to be cooler than the downstream reaches because this consists of the headwaters. Water temperatures in this section of the East Fork SFSR under the 2021 MMP would be similar to those under baseline conditions.

Meadow Creek upstream from EFMC has decreasing water temperatures during mine operations and closure/reclamation activities (Mine Year 6 through 18 as shown in Table 4.12-2) because water being piped is not exposed to solar radiation. Once the pipeline is removed, however, water temperatures increase until around Mine Year 27, at which time the replanted riparian vegetation becomes more established and stream shade is increased and water temperatures begin to decrease. This decrease continues through at least Mine Year 112. The temperature changes within the portion of Meadow Creek adjacent to the TSF area were also examined. This portion of Meadow Creek exhibits the specific effects of existing mining disturbance on the baseline condition and then the specific effects of TSF operation followed by stream restoration across the TSF and TSF Buttress. Predicted temperatures during the early
years of restored flow across the TSF and TSF Buttress are higher than average temperatures over the entirety of Meadow Creek because early revegetation efforts have not reached their riparian shading potential. However, the difference from existing conditions is smaller because the TSF area has a higher temperature under existing conditions than Meadow Creek as a whole.

EFMC experiences an increase in summer and fall maximum water temperatures during mine operations and closure/reclamation activities (Mine Year 6 through 18) and post-closure until Mine Year 52, at which point the temperatures decline compared to the baseline conditions (Table 4.12-2). Restoration activities on the EFMC is slated to begin in Mine Year 1, with the construction of the rock drain starting in Mine Year 3. EFMC flowing through the rock drain would reduce its exposure to solar radiation, thus resulting in a decrease in change in water temperatures between the meadow and the lower section of EFMC during the summer and fall months. By Mine Year 112, the difference in water temperature between the meadow and the lower EFMC is around 0.5°C for both the summer and fall maximums.

Water temperatures in the warmer summer and fall months in Meadow Creek downstream from EFMC substantially decreases relative to the baseline conditions during mine operations and closure/reclamation activities (Mine Year 6 through Mine Year 18), though there is an increase at Mine Year 27, which then continues to decline until Mine Year 112 (Table 4.12-2). These decreases during mine operations are a result of decreased solar radiation upstream sources. The removal of the low-flow piping along the TSF in Mine Year 23 would result in water temperatures increasing, though not as high as baseline conditions, and subsequently decreasing as the revegetation efforts take effect. This section retains some connection to groundwater which helps maintain a lower temperature as well.

The East Fork SFSR between Meadow Creek and Yellow Pine pit experiences decreases in summer maximum water temperatures relative to baseline conditions. There is a slight increase in temperatures, still lower than baseline, after Mine Year 22 once the low-flow piping along the TSF is removed, and temperatures continue to decrease once the revegetation efforts take effect. Fall maximum water temperature decrease throughout the operations, closure, and post-closure periods (Table 4.12-2).

East Fork SFSR between Yellow Pine pit and Sugar Creek, and similarly the East Fork SFSR roughly 1 km downstream from Sugar Creek, experiences an increase in summer and fall maximum water temperatures at Mine Year 6 because of the draining of the Yellow Pine pit lake followed by active mining and mine dewatering that removes cooling influences of upstream shading and groundwater discharge to surface water (Table 4.12-2). By Mine Year 112, summer maximum water temperatures in the East Fork SFSR between Yellow Pine pit and Sugar Creek are about 0.4°C higher than baseline conditions, but fall maximum temperatures, and summer maximum and fall maximum temperatures below Sugar Creek end up between 0.1 and 0.6°C below baseline conditions (Table 4.12-2).

The effects of the SGP on fish caused by changes to water temperature are expected to be minor to moderate, permanent, and localized for the East Fork SFSR and upstream from Meadow Creek, Meadow Creek upstream from the EFMC, EFMC, and East Fork SFSR downstream from Yellow Pine pit, but major, permanent, localized, and beneficial for Meadow Creek downstream from the EFMC, and for the East Fork SFSR between Meadow Creek and Yellow Pine pit.
Sediment and Turbidity

Fish population abundance, distribution, and survival have been linked to levels of turbidity and silt deposition. Excess sediment can degrade spawning gravels, reduce embryo survival and emergence, impair growth and survival of juvenile salmonids, fill pool habitat, and reduce the productivity of aquatic macroinvertebrates and other prey items for fish (Bjornn et al. 1977; Suttle et al. 2004). Prolonged exposure to high levels of suspended sediment would create a loss of visual capability in fish in aquatic habitats within the study area, leading to reduced feeding and growth rates; a thickening of the gills, potentially causing the loss of respiratory function; clogging and abrasion of gills; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995, Newcombe and Jensen 1996; Wilber and Clark 2001). It can also cause the movement and redistribution of fish populations.

Outside the Mine Site Area

Construction and use of roads can accelerate erosion and sediment delivery to streams and have been identified as the primary contributor of sediments to stream channels in managed watersheds (Trombulak and Frissell 2000). During the Burntlog Route construction, including bridge and culvert installations, the potential exists for increased runoff, erosion, and sedimentation resulting from localized vegetation removal and soil excavation which could result in increased sediment load in streams. Construction of and upgrades to access roads and utilities associated with the SGP creates a potential for increased runoff, erosion, and sedimentation as a result of localized vegetation removal and excavation of soil, rock, and sediment, which could result in increased sediment load in streams. Permit stipulations from IDWR and IDEQ would ensure streambank vegetation would be protected except where its removal is necessary. New cut or fill slopes not protected with some form of stabilization measures would be seeded and planted with native vegetation to prevent erosion. Use of temporary erosion and sediment control BMPs also would be employed.

During the construction phase, the 2021 MMP would be accessed by routes that would cross 43 streams (Section 4.9 and 4.16). In addition to these stream crossings, approximately 6.5 miles (18 percent of its 36-mile length) of the Johnson Creek Route is located in close proximity to streams (i.e., within 100 feet). The number of vehicle trips per day also is used in this analysis as a metric for potential increases in erosion and sedimentation. Section 4.16 discusses the number of trips per day during construction, operation, and closure and reclamation. A total of 65 vehicle trips per day would occur during the construction phase. During the mining and ore processing operations phase (approximately 15 years), a total of 50 vehicle trips per day are anticipated on average per day (year-round) during operations utilizing the Burntlog Route. During the closure and reclamation phase, traffic along the Burntlog Route would be reduced to a total of 27 vehicle trips per day (year-round).
## Table 4.12-2  Maximum Weekly Water Temperatures during July (Summer) and September (Fall) for Modeled Mine Years for the 2021 MMP

<table>
<thead>
<tr>
<th>Stream Drainage</th>
<th>Season</th>
<th>Baseline (°C)</th>
<th>2021 MMP Mine Year</th>
<th>Change from Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Baseline (°C)</td>
<td>6 (°C)</td>
<td>12 (°C)</td>
</tr>
<tr>
<td>East Fork SFSR Upstream of Meadow Creek</td>
<td>Summer</td>
<td>13.4</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>11.0</td>
<td>10.9</td>
<td>10.9</td>
</tr>
<tr>
<td>Meadow Creek Upstream of EFMC</td>
<td>Summer¹</td>
<td>14.0</td>
<td>12.4</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>Fall¹</td>
<td>12.0</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Summer²</td>
<td>16.8</td>
<td>13.5</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td>Fall²</td>
<td>14.2</td>
<td>11.2</td>
<td>11.0</td>
</tr>
<tr>
<td>Meadow Creek Downstream of EFMC</td>
<td>Summer</td>
<td>19.4</td>
<td>17.6</td>
<td>16.5</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>15.9</td>
<td>15.5</td>
<td>13.6</td>
</tr>
<tr>
<td>EFMC</td>
<td>Summer</td>
<td>14.6</td>
<td>15.8</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>12.6</td>
<td>13.5</td>
<td>13.1</td>
</tr>
<tr>
<td>East Fork SFSR between Meadow Creek and Yellow Pine pit</td>
<td>Summer</td>
<td>17.3</td>
<td>16.3</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>13.9</td>
<td>13.5</td>
<td>12.6</td>
</tr>
<tr>
<td>East Fork SFSR between Yellow Pine pit and Sugar Creek</td>
<td>Summer</td>
<td>14.1</td>
<td>16.1</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>11.2</td>
<td>13.0</td>
<td>12.4</td>
</tr>
<tr>
<td>East Fork SFSR Downstream of Sugar Creek</td>
<td>Summer</td>
<td>14.9</td>
<td>16.0</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>11.9</td>
<td>12.5</td>
<td>11.6</td>
</tr>
</tbody>
</table>

Increased temperatures attributable to climate change are not incorporated in the reported predicted values. Uncertainty in predicted temperature values increases over time due to assumptions made about the effects of stream restoration and riparian shading. The presented temperatures are based on effective implementation of the stream restoration and riparian shading.

¹ Temperatures based on distance-weighted average of all QUAL2K reaches.
² Temperatures based on distance-weighted average of the QUAL2K reaches along the TSF and TSF Buttress area downstream.
For stream crossings, Perpetua would replace existing, or install new, culverts or bridges at crossings along the Johnson Creek (CR 10-579), McCall-Stibnite (CR 50-412), and Burnt Log (FR 447) roads. Stream crossings associated with access roads would be designed to minimize potential impacts on surface water hydrology, water quality, and fish passage. The Forest Service would require stream crossings to be designed to accommodate a 100-year flood recurrence interval, unless site-specific analysis using calculated risk tools, or another method determines a more appropriate recurrence interval.

During the Burntlog Route construction including bridge and culvert installations, the potential exists for increased runoff, erosion, and sedimentation as a result of localized vegetation removal and excavation of soil, rock, and sediment, which could result in increased sediment load in streams. Expected permit stipulations from the IDWR and IDEQ would ensure that streambank vegetation would be protected except where its removal is absolutely necessary; that new cut or fill slopes not protected with some form of riprap would be seeded and planted with native vegetation to prevent erosion; use of temporary erosion and sediment control best management practices (BMPs) associated with a stormwater pollution prevention plan; and that all activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations.

For the Burntlog Route, the potential for sedimentation would be minimized using standard erosion control measures, such as silt fencing, ditch checks, and other measures, which would be installed and maintained to minimize the potential for erosion and sedimentation. Numerous small (15- to 60-inch) drainage culverts would be installed along the Burntlog Route to reduce rutting and shunt water out of ditches and off the road prism, which would serve to reduce erosion from the road into streams. Perpetua would maintain a hardened road surface with gravel surfacing to promote an efficient and useable all-weather road while minimizing erosion (Perpetua 2021a). Perpetua would also be required to comply with specific design requirements as part of the IDWR Stream Channel Alteration Permit, such as line of approach, minimum bridge clearance and minimum culvert size per length, and anchoring on steep slopes. Bridges and culverts would be maintained to allow proper drainage and limit sediment delivery to area streams. Based on permit-related design requirements, use of BMPs, and required maintenance activities, the potential for access road-related erosion and sedimentation would be minimal (limited to periods of substantial overland flow, such as from very large rainfall events).

Utilities associated with the SGP (existing transmission line upgrades and structure work, right-of-way (ROW) clearing, new transmission line, and transmission line access roads) would cross 37 different streams, as identified in Table 7-20 in the Water Quality Specialist Report (Forest Service 2022f). Of the 37 streams that would be crossed, 26 would be related to the upgrade of existing IPCo transmission lines, where the existing transmission line ROW crosses various streams. During transmission line upgrades and new transmission line construction, the potential exists for increased runoff, erosion, and sedimentation as a result of vegetation removal within the ROW, and the localized excavation of soil, rock, and sediment for structure work and/or ROW access roads. Expected permit stipulations from IDWR and IDEQ would be similar to the examples provided above for access roads and would ensure the use of erosion and sediment control BMPs associated with a stormwater pollution prevention plan. ROW vegetation clearing would retain vegetation root structure within soils thus reducing erosion concerns. Surface water quality also could be impacted during construction by fugitive dust from vehicles and heavy equipment that settles into adjacent water bodies. Reduction of these potential impacts would be achieved through fugitive dust control at the SGP. In dry months, Perpetua would spray water on mine
haul roads as necessary to mitigate dust emissions in compliance with state and Forest Service requirements.

The extent of sedimentation effects from fugitive dust would be concentrated at the SGP; however, due to the nature of sediment transport by streams, the geographic extent of the impact could extend farther downstream in the East Fork SFSR depending on site- and event-specific factors. The duration for traffic-related dust and erosion/sedimentation would last throughout the mine construction, operations, and post-closure periods; however, the potential for these effects would be incrementally reduced during closure and reclamation due to reduced activity at the SGP and stabilization of disturbed areas. Therefore, the effects of fugitive dust on fish would be minor, long-term and localized. The effects of the SGP construction of temporary roads and transmission lines on sedimentation on fish and aquatic habitat are expected to be moderate, short-term, and localized.

**Within the Mine Site Area**

Construction and active mining would disturb, excavate, and move soil and overburden thereby raising the potential for sediment runoff and suspended sediment increases in surface waters. Total suspended solids (TSS) in surface water are generally correlated with turbidity (NTU), which is a more visually apparent estimator of sediment contamination. Under baseline conditions, turbidity is generally low (less than 5 NTU) with occasional spikes of up to 70 NTU during snowmelt or rainfall events (Forest Service 2022f). The greatest potential for Project-related increases in stream sedimentation would come during storm events causing overland flow across exposed soil, excavated areas, and roads. BMPs would be employed for near-stream or instream work such as removal of legacy materials and stream restoration to minimize the potential for coarser sediment generation or mass wasting that would affect sediment transport and deposition. Under baseline conditions, sediment entering the East Fork SFSR primarily comes from Sugar Creek, Meadow Creek, and EFMC. Applicable sediment control design techniques BMPs would be used to minimize sediment runoff and erosion along roads and excavated areas. On the mine site and along the Burntlog route, expected permit conditions from IDWR and IDEQ would protect streambank vegetation, require culvert maintenance, and require low impact snow removal techniques.

Surface water quality also could be impacted during operations, closure, and reclamation by fugitive dust from vehicles and heavy equipment that settles into adjacent water bodies, as described above, outside the mine site area.

Potential Project-related sediment impacts on fish would include temporary turbidity increases during runoff events and localized deposition of fine sediment in stream channels. Turbidity increases during runoff events have the potential to temporarily change fish behavior but are unlikely to be severe enough, relative to baseline fluctuations, to cause fish mortality or health impacts. Increases in fine sediment deposition within stream channels have the potential to decrease spawning gravel suitability and decrease benthic invertebrate production within gravel riffles. These impacts would impact spawning/incubation and rearing/feeding life stages, respectively, of Chinook salmon, steelhead, bull trout, and westslope cutthroat trout. With the application of sediment reduction BMP’s and surface runoff minimizing design techniques, the impacts of sediment in surface water to fish are predicted to be measurable but not severe, limited to the mine area, and occur during the active mining period. However, the restoration efforts in the
EFMC would result in a substantial decrease in sediment input into Meadow Creek and the East Fork SFSR.

The effects of the 2021 MMP on sediment and turbidity on Chinook salmon, steelhead, bull trout, and westslope cutthroat trout would be moderate, permanent, and localized.

**Physical Barriers**

Physical barriers can affect fish population dynamics by reducing or blocking access to fish habitat. These barriers can be natural (gradient, woody debris, etc.) or human-made (culverts, altered creek channels due to human activities). Fish passage barriers can negatively impact fish population dynamics by reducing, or completely blocking, available habitat during certain life stages. Existing fish passage barriers within the mine site were identified as either complete - no species can move upstream or downstream at any time of year; or partial - the barrier may not exist at high flows but at certain flows (i.e., low flows) some fish may not be able to pass. Passage barriers are further categorized by natural - not caused by human action, such as a rock dam, log jam, and steep slopes; or artificial - caused by human action, such as culverts, stream alteration, and surface water diversions (BioAnalysts 2019).

**Outside the Mine Site Area**

During the construction of the Burntlog Route or of temporary roads, culverts would be constructed or replaced. Surveys were conducted to identify fish bearing streams along the Burntlog Route (Rio ASE 2021). Any new or reconstructed crossing is required to be fish passable, which would increase or re-establish fish access where it had been reduced or blocked unless there is a risk of passing non-native fish species. The potential re-establishment of access upstream of these culverts could affect the composition of the aquatic community. Changes in types of fish present and the abundance of fish could increase the risk of injury and mortality for some species. For instance, additional habitat could benefit some species, while the presence of additional fish in previously inaccessible reaches would introduce competition for resources. These changes may affect the distribution and relative abundance of fish populations in affected streams.

Furthermore, establishing or increasing access could allow non-native species to access upstream habitat that is currently blocked, such as brook trout. Brook trout are known to compete with bull trout for resources and habitat (USFWS 2008a). Brook trout also are known to hybridize with cutthroat trout, which has the potential to negatively impact the genetic integrity, and/or result in negative changes to the local population of cutthroat trout (USFWS 2008a). According to the Forest Plan standard, no barrier would be removed if increasing access between non-native species to sensitive native species would occur. Additionally, brook trout presence is minimal along the Burntlog Route (MWH 2017, Stantec 2018 and 2019).

The effects of the SGP on fish access during construction of temporary roads are expected to be negligible, short-term, and localized.
Within the Mine Site Area

Existing and predicted fish passage barriers, as well as the removal of barriers resulting from the 2021 MMP are shown in Figure 4.12-2. Table 4.12-3 presents a summary of the fish barriers conditions, as well as the length of stream channel changes post-closure, which includes both the new access as well as blocked access to stream channels into existing stream reaches in construction diversion and stream enhancements.

Species-specific impacts to aquatic habitat resulting from passage barriers were assessed for Chinook salmon and steelhead through the evaluation of the extent of both Critical Habitat and IP. Impacts to aquatic habitat from passage barriers for bull trout and westslope cutthroat trout were assessed by quantifying the extent of Critical Habitat (bull trout) and occupancy probability (for both). Additional information is provided below and in ESS 2019b.

The greatest benefit to Chinook salmon and steelhead passage comes in Mine Year -1 with the construction of the fishway, which would allow these species to volitionally access habitat that they have not naturally accessed for decades. The fishway may be a partial barrier by discouraging migration of some fish, but the extent of this is unknown. By Mine Year 11, the East Fork SFSR, where the Yellow Pine pit is located, would have been restored, providing natural conditions for volitional passage. Additionally, the box culvert, 2.88 km upstream from the Yellow Pine pit cascade barrier would be modified to provide full passage. This substantially increases the amount of habitat volitionally available to Chinook salmon and steelhead that are not currently accessible (Table 4.12-3).

Based on the current known extent of bull trout occupancy, bull trout may be extirpated from the reaches upstream from the TSF when the reaches within the footprint would be dewatered and flow would be diverted into the diversions that route water around the facilities. With the gradient barrier that would be created along the TSF, there would be no mechanism by which bull trout would be able to volitionally (i.e., naturally) recolonize the reaches upstream from or on top of the TSF. Based on the current known extent westslope cutthroat trout occupancy, fish in the upper headwaters of Meadow Creek would remain isolated.

The effects of the SGP on fish access for Chinook salmon and steelhead, to upstream habitat are expected to be major, permanent, and localized benefits, but for bull trout and westslope cutthroat trout the effects are expected to be major, permanent, and localized impacts.
<table>
<thead>
<tr>
<th>Stream/ Location</th>
<th>Mine Year Added/Removed</th>
<th>Length of Chinook Salmon Habitat (km)</th>
<th>Length of Steelhead Habitat (km)</th>
<th>Length of Bull Trout and Cutthroat Trout Habitat (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Change in Total Available (^1,2)</td>
<td>Change in Total Available (^2)</td>
<td>Change in Total Available (^1,4)</td>
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<td></td>
<td></td>
<td>Change Attributed to Barrier (^1)</td>
<td>Change Attributed to Barrier (^2)</td>
<td>Change Attributed to Barrier (^1,4)</td>
</tr>
<tr>
<td>Existing Barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFSFSR above YPP (02)</td>
<td>Removed: Mine Year -1</td>
<td>+19.65(^1)</td>
<td>+1.44(^1)</td>
<td>+19.54(^1)</td>
</tr>
<tr>
<td>Artificial – Gradient</td>
<td>(Tunnel); Mine Year 11</td>
<td>+8.87(^2)</td>
<td>+0.27(^2)</td>
<td>+32.82</td>
</tr>
<tr>
<td></td>
<td>(Channel reconstruction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1.77(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFSFSR (203)</td>
<td>Removed: Mine Year -1</td>
<td>+16.87(^1)</td>
<td>+1.44(^1)</td>
<td>+16.66(^1)</td>
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<tr>
<td>Artificial – Box Culvert</td>
<td></td>
<td>+6.29(^2)</td>
<td>+0.27(^2)</td>
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<tr>
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<td>+6.90(^2)</td>
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<tr>
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<td>+1.77(^2)</td>
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<tr>
<td>Fiddle Creek (04)</td>
<td>Removed: Mine Year -4</td>
<td>NP</td>
<td>NP</td>
<td>NP(^1)</td>
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<tr>
<td>Artificial – Gradient</td>
<td></td>
<td></td>
<td></td>
<td>-0.72(^4)</td>
</tr>
<tr>
<td>Fiddle Creek (200)</td>
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<td>NP</td>
<td>NP(^1)</td>
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<tr>
<td>Artificial - Culvert</td>
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<tr>
<td>Meadow Creek (05)</td>
<td>Removed: Mine Year 3</td>
<td>NP</td>
<td>NP</td>
<td>NP(^1)</td>
</tr>
<tr>
<td>Artificial - Gradient</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Fork Meadow Creek (06)</td>
<td>Removed: Mine Year -1</td>
<td>NP</td>
<td>NP</td>
<td>NP(^1)</td>
</tr>
<tr>
<td>Natural - Gradient</td>
<td></td>
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<tr>
<td>Created Barriers</td>
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<tr>
<td>Meadow Creek Diversion</td>
<td>New: Mine Year -2</td>
<td>NP</td>
<td>NP</td>
<td>NP(^1)</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>Meadow Creek TSF</td>
<td>New: Mine Year 18</td>
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<td>Artificial - Gradient</td>
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<td>New: Mine Year -1</td>
<td>NP</td>
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<td>NP(^1)</td>
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<td>Artificial – Rock Drain/Gradient</td>
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<td>East Fork Meadow Creek</td>
<td>New: Mine Year 22</td>
<td>NP</td>
<td>NP</td>
<td>NP(^1)</td>
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<td>Artificial - Gradient</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Results based on potential Critical Habitat
\(^2\) Results based on usable Intrinsic Potential habitat, but not always accessible
\(^3\) Not all of the total habitat is accessible habitat under baseline conditions
\(^4\) Results based on usable occupancy potential, but not always accessible
EFSFSR = East Fork South Fork Salmon River; km = kilometer; NP = not present, YPP = Yellow Pine pit
Chemical Contaminants

Outside the Mine Site Area

There is the potential for spills to occur along access roads as fuel and other materials are trucked to and from the 2021 MMP. If a spill were to occur at a stream crossing or near a stream, surface water could be impacted. Discussion of very low probability scenarios for a large release (tanker truck or concentrate truck rollover), and more probable scenarios involving small releases, is provided Section 4.9. Overall, EDFs (Section 2.4.9) and permit stipulations and regulatory requirements from state and federal agencies (including use of USDOT-certified containers and registered transporters) would reduce the risk of spills and ensure that effective response is provided should a spill occur.

The most probable release scenario associated with truck transport on the access routes to the SGP would be relatively small amounts of fuel spilled from vehicles themselves and attributed to mechanical failure or human error. Under this scenario, immediate cleanup actions would include deployment of containment and spill recovery materials, and removal of impacted soil. Fuel spilled to soils/roadbed could be readily contained and recovered, while fuel which enters waterways via roadside drainages may be difficult or impossible to fully recover and there would be potential for migration beyond the immediate spill area. Spill response materials on the vehicles and pre-positioned along the access routes and in SGP response vehicles would include materials to contain and recover floating oil. Response actions would include notification to the appropriate regulatory agencies.

Small volume release scenarios would be temporary due to prompt response and cleanup actions; however, higher volume/lower probability spill scenarios could result in longer-term remedial actions and impacts. The risk of spills would last throughout the life of the SGP (long term). Effects would generally be local and in close proximity to the release source in most scenarios; however, if surface or groundwater were to be impacted with fuels or other hazardous materials, the potential for migration beyond the local area could occur.

A low probability release of liquid petroleum or hazardous material from a bulk truckload could potentially occur assuming the puncture of the bulk tanker in the accident. Under this scenario, spilled material would be released to the immediate roadbed area, and potentially impact physical resources and ecological receptors (e.g., vegetation or wildlife) and nearby surface water depending on the topography and location. Spill response and recovery measures such as containment, deployment of absorbent materials, removal of impacted roadbed material and vegetation, and deployment of water-based spill recovery materials and equipment (as needed) would help to limit impacts.

A release of large quantities of solid hazardous materials such as cyanide or antimony concentrate would also be unlikely. Breaches of the shipping containers for these materials in the case of an accident could release the solid materials to the ground where it would reside until response actions are taken to mechanically clean it up, along with any contaminated soil. Migration of these solid materials from the immediate release site would be less likely than for liquid materials but could be possible in wet weather conditions. Again, spill response and recovery measures would help to limit impacts.
The pilot vehicles that would accompany all transports of fuel or hazardous materials between the SGLF and the Operations Area Boundary would carry spill response tools and materials, communications equipment, and drivers trained in spill responses. Thus, response to a small to moderate spill of fuel or hazardous material during transit over the SGP access roads would essentially be immediate.

Spill containment and countermeasures equipment and materials would be pre-positioned at the SGP mine site, Burntlog Maintenance Facility, and SGLF. In the event of a major spill requiring assistance from any of these locations, the radio communications between the pilot vehicles and these facilities would enable a timely response which would take an estimated 45 minutes to mobilize and arrive at the spill site.

Close proximity of access roads to surface water resources increases the potential for spilled material on the roadways to enter water, thus increasing the potential consequences of a spill. The Burntlog Route crosses 37 streams and includes 9 miles of road that are within 0.5 mile of surface water resources. The Johnson Creek Route crosses 43 different streams and includes 27 miles of road that are within 0.5 mile of surface water resources, including several miles that parallel the fish-bearing East Fork SFSR and Johnson Creek waterways. Though the Burntlog Route includes a greater number of stream crossings, the Johnson Creek Route includes significantly greater proximity to water resources. The potential consequences from trucking spills would thus be greater along the Johnson Creek Route that would be utilized during construction of the Burntlog Route.

Of all the substances to be transported, fuel may pose the highest risk to fish and fish habitat with delivery of 5.8 million gallons of diesel and 0.5 million gallons of gasoline expected annually via tanker truck. This is because large quantities of diesel fuel are transported in each load, numerous trips are made each year, and the substance is a liquid that rapidly flows down gradient toward nearby streams. The intensity of the impact of a hazardous materials spill on fish and aquatic habitat could be high; as a large diesel spill could kill 100 percent of the Chinook salmon juveniles, adults, alevins, and eggs for a considerable distance (several miles) downstream of the accident (NMFS 1995). In terms of toxicity to water-column organisms, diesel is one of the most acutely toxic oil types. Fish, invertebrates, and aquatic vegetation that come in direct contact with a diesel spill may be killed (EPA 2019c). The severity of the impact would depend on the timing, size, and location of the spill. Small spills in deep open waters are expected to rapidly dilute; however, fish kills have been reported for small spills in confined, shallow water (EPA 2019c). Diesel from a spill could mix with spawning gravels and sand and be retained in the stream substrate for a year or more, and thereby negatively affect salmon eggs, alevins, and juveniles for several years (Korn and Rice 1981; Moles et al. 1981).

It is expected the risk associated with a spill large enough to negatively affect fish or aquatic habitat would generally be low but possible. An exception may be when materials are transported during inclement weather conditions, this could increase the risk to moderate. Spills during the winter would be easier to contain because spilled material would not penetrate frozen ground as readily as unfrozen ground, and snow could absorb the spilled material, in addition to the visual contrast between snow and fuel could aid in cleanup. However, areas that are harder to access may increase the time it takes to access and cleanup a spill, creating the potential for fish or aquatic habitat to be in contact with a hazardous material longer and could impact more fish or fish habitat.
While the likelihood of a spill is negligible to moderate, the magnitude of impacts could be major to individuals exposed to harmful concentrations of hazardous materials making impacts of spills moderate, temporary, and localized depending on the type of material releases, the location of the spill, and the presence of fish and aquatic species in the affected area.

**Within the Mine Site Area**

The West End pit lake would not be reclaimed or restored and would therefore have impacts on fish in perpetuity. Based on the pit lake geochemical model (Section 4.9), predicted West End pit lake water chemistry exhibits circumneutral pH conditions with TDS concentrations below 130 mg/L. Antimony, arsenic, and mercury concentrations that exceed the strictest potentially applied water quality standards throughout the operating and closure period. Predicted concentrations of copper and lead are predicted to exceed the strictest potentially applied water quality standards during pit dewatering operations, when produced water is routed for consumptive use and water treatment but decrease below those levels during as the lake fills. Concentrations of arsenic, mercury, and antimony are predicted to slightly exceed the strictest potentially applied water quality standards permanently post-closure. The West End pit lake would be fishless given the absence of fish in West End Creek. Therefore, impacts to fish from contaminants in the West End pit lake would be limited to contaminants entering Sugar Creek via outlet spillage or seepage after the closure and reclamation of the mine. The volume of water entering Sugar Creek would be small relative to the flow of the creek and any contaminants from the West End pit lake would be further diluted at the confluence with the East Fork SFSR. Effects of the SGP to fish, including Chinook salmon, steelhead, bull trout, and west slope cutthroat trout, as well as other native fish species in Sugar Creek, from the West End pit lake contaminants would be minor, permanent, and localized.

Wastewater treatment plant effluent would be discharged to the East Fork SFSR at a location near the worker housing facility. The sanitary wastewater treatment and discharge would occur at a single location during the active life of the mine and therefore impacts to fish would be minor, long-term, and localized.

Fuel storage and handling would be conducted in accordance with a SPCC Plan that would utilize surface storage tanks with primary and secondary containment. There would not be any uncontained or underground infrastructure associated with fuel storage. Therefore, releases from fuel storage would not be expected to contact the environment or affect fish and aquatic habitat, so effects would be none to negligible, long-term, and localized.

Long-term impacts from contaminants would include those during the active mine life and reclamation periods during which contact water would be treated to minimize multiple contaminants. Chemical contaminant loads were modeled under baseline, active mining, and post-reclamation conditions at multiple sites within the 2021 MMP (Table 4.12-4) (Section 4.9). Impact magnitudes for contaminants are measured relative to IDEQ criteria for protection of aquatic life.
### Table 4.12-4  Exceedance of Analysis Criteria, Operations and Post Closure for Assessment Nodes

<table>
<thead>
<tr>
<th>Constituent of Concern Analysis Criteria</th>
<th>Aluminum¹</th>
<th>Copper²</th>
<th>Antimony³</th>
<th>Arsenic⁴</th>
<th>Mercury⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.36 mg/L</td>
<td>0.0024 mg/L</td>
<td>0.0056 mg/L</td>
<td>0.010 mg/L</td>
<td>2 ng/L (total mercury)</td>
</tr>
<tr>
<td><strong>Nodes</strong></td>
<td><strong>Stream</strong></td>
<td><strong>Exceedance During Operations (Highest Concentration)⁶</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.007 mg/L versus 0.018 mg/L).</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.023 mg/L versus 0.083 mg/L).</td>
</tr>
<tr>
<td>YP-T-22</td>
<td>Meadow Creek</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.014 mg/L versus 0.025 mg/L).</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.018 mg/L versus 0.075 mg/L).</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.018 mg/L versus 0.030 mg/L).</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.023 mg/L versus 0.051 mg/L).</td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations below baseline conditions (0.004 to 0.021 mg/L versus 0.006 to 0.031 mg/L) throughout mining.</td>
<td>Concentrations below baseline conditions (0.012 to 0.032 mg/L versus 0.018 to 0.052 mg/L) throughout mining.</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations below baseline conditions (0.005 to 0.027 mg/L versus 0.006 to 0.030 mg/L) throughout mining.</td>
<td>Concentrations at or below baseline conditions (0.013 to 0.041 mg/L versus 0.017 to 0.041 mg/L) throughout mining.</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations primarily below baseline conditions (0.005 to 0.063 mg/L versus 0.008 to 0.056 mg/L) throughout mining. Concentrations above baseline occur in Mine Year -2 at the transition from baseline to construction.</td>
<td>Concentrations below baseline conditions (0.013 to 0.097 mg/L versus 0.019 to 0.120 mg/L) throughout mining.</td>
</tr>
<tr>
<td>Constituent of Concern Analysis Criteria</td>
<td>Aluminum¹</td>
<td>Copper²</td>
<td>Antimony³</td>
<td>Arsenic⁴</td>
<td>Mercury⁵</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td>-----------</td>
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<td>---------</td>
</tr>
<tr>
<td></td>
<td>0.36 mg/L</td>
<td>0.0024 mg/L</td>
<td>0.0056 mg/L</td>
<td>0.010 mg/L</td>
<td>2 ng/L (total mercury)</td>
</tr>
<tr>
<td><strong>Nodes</strong></td>
<td><strong>Stream</strong></td>
<td><strong>Concentrations During Operations (Highest Concentration)⁶</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork</td>
<td>None</td>
<td>None</td>
<td>Concentrations primarily below baseline conditions (0.004 to 0.041 mg/L versus 0.005 to 0.037 mg/L) throughout mining. Concentrations above baseline occur in Mine Year -2 at the transition from baseline to construction.</td>
<td>Concentrations below baseline conditions (0.010 to 0.066 mg/L versus 0.014 to 0.076 mg/L) throughout mining.</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.008 mg/L versus 0.018 mg/L) until Mine Year 20.</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.017 mg/L versus 0.083 mg/L) until Mine Year 20.</td>
</tr>
<tr>
<td>YP-T-27</td>
<td>Meadow Creek</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.006 mg/L versus 0.025 mg/L) until Mine Year 20.</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.013 mg/L versus 0.075 mg/L) until Mine Year 20.</td>
</tr>
<tr>
<td>YP-SR-10</td>
<td>East Fork</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.006 mg/L versus 0.025 mg/L) until Mine Year 20.</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.013 mg/L versus 0.075 mg/L) until Mine Year 20.</td>
</tr>
<tr>
<td>Constituent of Concern Analysis Criteria</td>
<td>Aluminum(^1)</td>
<td>Copper(^2)</td>
<td>Antimony(^3)</td>
<td>Arsenic(^4)</td>
<td>Mercury(^5)</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td></td>
<td>0.36 mg/L</td>
<td>0.0024 mg/L</td>
<td>0.0056 mg/L</td>
<td>0.010 mg/L</td>
<td>2 ng/L (total mercury)</td>
</tr>
<tr>
<td>Nodes</td>
<td>Stream</td>
<td>Exceedance During Operations (Highest Concentration)(^6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YP-SR-8</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Seasonal peaks lower than baseline seasonal peaks (0.011 mg/L versus 0.031 mg/L) throughout post-closure period.</td>
<td>Concentrations below baseline conditions (0.012 to 0.025 mg/L versus 0.018 to 0.052 mg/L) throughout post-closure period.</td>
</tr>
<tr>
<td>YP-SR-6</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations below baseline conditions (0.005 to 0.020 mg/L versus 0.006 to 0.030 mg/L) throughout post-closure period.</td>
<td>Concentrations below baseline conditions (0.012 to 0.029 mg/L versus 0.017 to 0.041 mg/L) throughout post-closure period.</td>
</tr>
<tr>
<td>YP-SR-4</td>
<td>East Fork SFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations below baseline conditions (0.005 to 0.023 mg/L versus 0.008 to 0.056 mg/L) throughout post-closure period.</td>
<td>Concentrations below baseline conditions (0.013 to 0.063 mg/L versus 0.019 to 0.120 mg/L) throughout post-closure period.</td>
</tr>
<tr>
<td>YP-SR-2</td>
<td>East Fork FSFSR</td>
<td>None</td>
<td>None</td>
<td>Concentrations below baseline conditions (0.003 to 0.016 mg/L versus 0.005 to 0.037 mg/L) throughout post-closure period.</td>
<td>Concentrations below baseline conditions (0.010 to 0.047 mg/L versus 0.014 to 0.076 mg/L) throughout post-closure period.</td>
</tr>
<tr>
<td>YP-T-6</td>
<td>West End Creek</td>
<td>None</td>
<td>None</td>
<td>Concentrations slightly above baseline conditions (0.008 to 0.014 mg/L versus 0.008 to 0.012 mg/L) throughout post-closure period.</td>
<td>Concentrations slightly above baseline conditions (0.064 to 0.094 mg/L versus 0.064 to 0.088 mg/L) throughout post-closure period.</td>
</tr>
<tr>
<td>Constituent of Concern Analysis Criteria</td>
<td>Aluminum&lt;sup&gt;1&lt;/sup&gt; 0.36 mg/L</td>
<td>Copper&lt;sup&gt;2&lt;/sup&gt; 0.0024 mg/L</td>
<td>Antimony&lt;sup&gt;3&lt;/sup&gt; 0.0056 mg/L</td>
<td>Arsenic&lt;sup&gt;4&lt;/sup&gt; 0.010 mg/L</td>
<td>Mercury&lt;sup&gt;5&lt;/sup&gt; 2 ng/L (total mercury)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------</td>
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<td>-------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>Nodes</strong></td>
<td><strong>Stream</strong></td>
<td><strong>Concentration</strong></td>
<td><strong>Exceedance During Operations (Highest Concentration)&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td><strong>Concentration</strong></td>
<td><strong>Exceedance During Operations (Highest Concentration)&lt;sup&gt;6&lt;/sup&gt;</strong></td>
</tr>
<tr>
<td>YP-T-1</td>
<td>Sugar Creek</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Concentrations at or slightly above baseline conditions (0.007 to 0.017 mg/L versus 0.007 to 0.016 mg/L) throughout post-closure period.</td>
</tr>
</tbody>
</table>

Source: SRK 2018b, Brown and Caldwell 2020b

1 Aluminum: Lowest predicted for the SGP area based on Recommended Aquatic Life Criteria (EPA 2018); The same water quality data as in the Biotic Ligand Model were used (Brown and Caldwell 2020c).

2 Copper analysis criteria was derived using the Biotic Ligand Model per guidance contained in IDEQ (2017). A conservative chronic copper analysis criteria was estimated by applying the lowest of the 10th percentile chronic criteria based on regional classifications for the Salmon River Basin, Idaho Batholith, and third order streams. Per the SGP Water Quality Management Plan (Brown and Caldwell 2020a), preliminary calculations using the Biotic Ligand Model and site-specific data have produced similar values to the standard derived using these regional classifications.

3 Antimony does not have a specified NMFS or USFWS standard and is based on EPA’s human health chronic criterion for consumption of water and organisms is 0.0056 mg/L.

4 Arsenic: NMFS (2014) and USFWS (2015a) both determined jeopardy for the chronic criterion proposed by EPA for Idaho Water Quality Standards (0.150 mg/L). NMFS (2014) directed EPA to promulgate or approve new aquatic life criterion. In the interim, NMFS directed EPA to ensure the 0.010 mg/L human health criterion applied in all NPDES permits. USFWS (2015a) directed EPA to ensure that the 10 µg/L recreational use standard is applied in all WQBELs and Reasonable Potential to Exceed Calculations using the human health criteria and the current methodology for developing WQBELs to protect human health.

5 Mercury: NMFS (2014) and USFWS (2015a) both determined jeopardy for the chronic criterion proposed by EPA for Idaho Water Quality Standards (0.000012 mg/L total mercury). NMFS (2014) directed EPA to promulgate or approve a new criterion. In the interim, implement the fish tissue criterion that IDEQ adopted in 2005. Where fish tissue is not readily available, then NMFS specified application of a 0.000002 mg/L criteria (as total mercury) in the interim. USFWS (2015a) directed EPA to use the 2001 EPA/2005 Idaho human health fish tissue criterion of 0.3 mg/kg wet weight for WQBELs and reasonable potential to exceed criterion calculations using the current methodology for developing WQBELs to protect human health.

6 Predicted future concentrations are reported on a monthly basis. Concentrations in some locations vary naturally on a seasonal basis and, therefore, exceed baseline in certain months (usually Spring) and are lower than baseline in other months. Exceedances reported in this table are only those interpreted to be a result of mining activity, and not due to natural seasonal variability.
Copper and Aluminum
Exceedances of criteria for copper and aluminum occur under baseline conditions at some sites near the TSF but not downstream below Sugar Creek under baseline conditions. No exceedances are expected during active mining and post-closure (Table 4.12-4). The impacts of copper and aluminum are expected to be minimal relative to baseline conditions. Therefore, the effects of the 2021 MMP on fish are expected to be minor, long-term, and localized.

Arsenic and Antimony
Surface water concentrations of arsenic and antimony downstream from the mine site area would be reduced during the active mining period relative to baseline conditions due to water treatment. Permanent impacts to contaminant concentrations in downstream surface waters would extend post-closure. Model results (Section 4.9) indicate antimony concentrations in the East Fork SFSR downstream of Sugar Creek would be reduced permanently post-closure but arsenic concentrations would return to at or near baseline levels over time. The effects of the 2021 MMP on fish related to arsenic and antimony would be minor, long-term, localized, and beneficial.

Mercury
Mercury concentrations in the East Fork SFSR downstream of Sugar Creek would be predicted to increase during active mining due to expanded excavation. Concentration would then be predicted to decrease post-closure but remain slightly elevated relative to baseline conditions (Section 4.9.2.2 and Forest Service 2022f). Baseline, predicted active mine, and predicted post-closure mercury concentrations in the East Fork SFSR downstream of Sugar Creek would not exceed the aquatic life criterion. However, uncertainty remains whether incremental change in mercury concentrations beyond baseline would increase bioaccumulation of methylmercury in fish tissue at concentrations exceeding the tissue-based criterion. Methylation and bioaccumulation of mercury generally increases downstream in most watersheds. Through bioaccumulation and biomagnification, methylmercury reaches the highest concentrations in the tissues of longer lived, larger, or more piscivorous fish species. Long-term, regional influences on downstream mercury methylation are not quantified.

Stream Flow
Changes in stream flow directly affects fish habitat. Changes to stream flow were evaluated using simulated monthly discharge for the August to March low-flow period for Mine Years -2 through post-closure. Section 4.8 and the SGP Water Quantity Specialist Report (Forest Service 2022e) provides additional descriptions of how much streamflow changes as a function of mine operations, including locations without gaging data (i.e., downstream of Sugar Creek). Table 4.12-5 shows predicted (simulated) monthly stream flows during the August to March low flow period at five USGS gaging stations and one location in lower Meadow Creek in mine site streams (Figure 3.8-3) and predicted change from average baseline low flow period stream flows. Figure 4.12-3 shows the percent change in simulated stream flows graphically.
Figure 4.12-3  Average percent change in stream flow during the Low Flow Period (August to March)

Table 4.12-5  Percent Change in Streamflow from Baseline Streamflow for the Low-Flow Period over the Active Mine Years and Post-Closure Period for the 2021 MMP

<table>
<thead>
<tr>
<th>USGS Gage Mine Year</th>
<th>13311250 East Fork SFSR Upstream of Sugar</th>
<th>1331100 East Fork SFSR at Stibnite</th>
<th>13310800 East Fork SFSR Upstream of Meadow Creek</th>
<th>MC-6 Meadow Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>1.5%</td>
<td>1.8%</td>
<td>0.0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>-1</td>
<td>-6.8%</td>
<td>-2.1%</td>
<td>0.0%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>1</td>
<td>-12.4%</td>
<td>-4.4%</td>
<td>0.0%</td>
<td>-8.1%</td>
</tr>
<tr>
<td>2</td>
<td>-21.2%</td>
<td>-6.2%</td>
<td>0.0%</td>
<td>-11.2%</td>
</tr>
<tr>
<td>3</td>
<td>-18.6%</td>
<td>-8.6%</td>
<td>0.0%</td>
<td>-16.0%</td>
</tr>
<tr>
<td>4</td>
<td>-18.1%</td>
<td>-12.0%</td>
<td>0.0%</td>
<td>-22.6%</td>
</tr>
<tr>
<td>5</td>
<td>-6.9%</td>
<td>1.4%</td>
<td>-0.2%</td>
<td>3.7%</td>
</tr>
<tr>
<td>6</td>
<td>-18.7%</td>
<td>-13.1%</td>
<td>-0.5%</td>
<td>-22.3%</td>
</tr>
<tr>
<td>7</td>
<td>-24.8%</td>
<td>-20.4%</td>
<td>-0.5%</td>
<td>-36.4%</td>
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<td>-18.6%</td>
<td>-11.1%</td>
<td>-0.2%</td>
<td>-20.0%</td>
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<td>-14.1%</td>
<td>-4.8%</td>
<td>0.0%</td>
<td>-8.8%</td>
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<td>-16.4%</td>
<td>-5.1%</td>
<td>0.0%</td>
<td>-9.3%</td>
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<td>-4.5%</td>
<td>0.0%</td>
<td>-8.4%</td>
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<td>-10.1%</td>
<td>-4.2%</td>
<td>0.0%</td>
<td>-7.9%</td>
</tr>
<tr>
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<td>-13.5%</td>
<td>-6.0%</td>
<td>-1.7%</td>
<td>-9.8%</td>
</tr>
<tr>
<td>14</td>
<td>-11.0%</td>
<td>-5.9%</td>
<td>-3.6%</td>
<td>-8.2%</td>
</tr>
<tr>
<td>15</td>
<td>-5.1%</td>
<td>-3.0%</td>
<td>-1.6%</td>
<td>-5.9%</td>
</tr>
<tr>
<td>USGS Gage Mine Year</td>
<td>13311250 East Fork SFSR Upstream of Sugar</td>
<td>1331100 East Fork SFSR at Stibnite</td>
<td>13310800 East Fork SFSR Upstream of Meadow Creek</td>
<td>MC-6 Meadow Creek</td>
</tr>
<tr>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>16</td>
<td>-3.0%</td>
<td>-1.1%</td>
<td>-1.2%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>17</td>
<td>-4.2%</td>
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<td>-3.8%</td>
<td>-3.9%</td>
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<td>-2.7%</td>
<td>-4.5%</td>
</tr>
<tr>
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<td>-2.8%</td>
<td>-3.6%</td>
</tr>
<tr>
<td>20</td>
<td>-2.4%</td>
<td>-1.4%</td>
<td>-1.6%</td>
<td>-2.0%</td>
</tr>
<tr>
<td>Post-Closure</td>
<td>0.9%</td>
<td>1.7%</td>
<td>-1.9%</td>
<td>-0.6%</td>
</tr>
</tbody>
</table>

Note: The Low-Flow Period for Post-closure is defined as average of Mine Years 21 through 112. Numbers represent percent change in stream flow; negative numbers indicate a reduction in stream flow while positive numbers indicate an increase in stream flow. Sugar Creek is summarized by itself because data were available for Sugar Creek. There is a relationship between percent change in flow and the amount of available habitat per species and life stage. MC-6 is located in the lower reaches of Meadow Creek.

The greatest predicted changes to stream flow under the 2021 MMP would be in the East Fork SFSR and in Meadow Creek in the vicinity of the TSF. While most of the streams would return to at or near baseline flows post-closure (post-closure flows represent an average of the predicted flows from Mine Years 21 through 112), Meadow Creek flows downstream of the TSF would be reduced by a maximum of 36.4 percent during mine operations. Flow increases in Mine Year 5 at some nodes are due to dewatering and subsequent filling of the Hangar Flats pit and dewatering of the Yellow Pine pit.

The effects of the 2021 MMP on changes in stream flow would be major, long-term (occurring during operations), and localized at the Meadow Creek, East Fork SFSR at Stibnite, and East Fork SFSR upstream from Sugar Creek sites, but minor, long-term (occurring during operations), and localized at the East Fork SFSR upstream from Meadow Creek. Permanent effects from changes in streamflow, that occur during the post-closure would be negligible across all of the mine sites. The effects of reduced stream flow on habitat and productivity are described in the sections below.

Summary of Effects to Watershed Condition Indicators

The WCIs evaluate stream function by measuring elements that reflect water quality, habitat access, channel conditions and dynamics, flow and hydrology, and watershed conditions. Not all WCI indicators summarized for baseline conditions are of equal value in determining the potential impacts of the SGP within the analysis area. The impact analyses addressed the WCIs which are summarized in Table 4.12-6.
## Table 4.12-6  Summary of Changes to Key Watershed Condition Indicators at the Mine Site

<table>
<thead>
<tr>
<th>WCI</th>
<th>Stream Segment</th>
<th>Change From Baseline</th>
<th>Construction (Mine Year -1 to 1)</th>
<th>Operations/ Closure (Mine Year 1 to 20)</th>
<th>Post-Closure (Mine Year 20+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Temperature</td>
<td>East Fork SFSR between Sugar Creek and Yellow Pine pit</td>
<td>FR</td>
<td>FR (*)</td>
<td>FR (*)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR between Yellow Pine pit and Meadow Creek</td>
<td>FR</td>
<td>FR (*)</td>
<td>FR (*)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>Meadow Creek and East Fork Meadow Creek</td>
<td>FR</td>
<td>FR (+)</td>
<td>FR (+)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>FR</td>
<td>FR (*)</td>
<td>FR (*)</td>
<td>FR (*)</td>
</tr>
<tr>
<td>Sediment and Turbidity</td>
<td>East Fork SFSR between Sugar Creek and Yellow Pine pit</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (*)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR between Yellow Pine pit and Meadow Creek</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (*)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>Meadow Creek and East Fork Meadow Creek</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (+)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FUR (*)</td>
<td>FUR (*)</td>
</tr>
<tr>
<td>Physical Barriers</td>
<td>East Fork SFSR between Sugar Creek and Yellow Pine pit</td>
<td>FUR</td>
<td>FA (+)</td>
<td>FA (+)</td>
<td>FA (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR between Yellow Pine pit and Meadow Creek</td>
<td>FUR</td>
<td>FA (+)</td>
<td>FA (+)</td>
<td>FA (+)</td>
</tr>
<tr>
<td></td>
<td>Meadow Creek and East Fork Meadow Creek</td>
<td>FUR</td>
<td>FUR (-)</td>
<td>FUR (-)</td>
<td>FUR (-)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>FUR</td>
<td>FA (+)</td>
<td>FA (+)</td>
<td>FA (+)</td>
</tr>
</tbody>
</table>
### Change From Baseline

<table>
<thead>
<tr>
<th>WCI</th>
<th>Stream Segment</th>
<th>Baseline</th>
<th>Construction (Mine Year -1 to 1)</th>
<th>Operations/ Closure (Mine Year 1 to 20)</th>
<th>Post-Closure (Mine Year 20+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Peak/Base Flows</td>
<td>East Fork SFSR between Sugar Creek and Yellow Pine pit</td>
<td>FA</td>
<td>FA (*)</td>
<td>FR (-) to Mine Year 6 FA (*) after Mine Year 6</td>
<td>FA (*)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR between Yellow Pine pit and Meadow Creek</td>
<td>FA</td>
<td>FA (*)</td>
<td>FR (-) to Mine Year 6 FA (*) after Mine Year 6</td>
<td>FA (*)</td>
</tr>
<tr>
<td></td>
<td>Meadow Creek and East Fork Meadow Creek</td>
<td>FA</td>
<td>FA (-)</td>
<td>FR (-) to Mine Year 6 FA (*) after</td>
<td>FA (*)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>FA</td>
<td>FA (*)</td>
<td>FA (*)</td>
<td>FA (*)</td>
</tr>
<tr>
<td>Chemical Contaminants</td>
<td>East Fork SFSR between Sugar Creek and Yellow Pine pit</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (+)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR between Yellow Pine pit and Meadow Creek</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (+)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>Meadow Creek and East Fork Meadow Creek</td>
<td>FUR</td>
<td>FUR (*)</td>
<td>FR (+)</td>
<td>FR (+)</td>
</tr>
<tr>
<td></td>
<td>East Fork SFSR Upstream from Meadow Creek</td>
<td>FA</td>
<td>FA (*)</td>
<td>FA (*)</td>
<td>FA (*)</td>
</tr>
</tbody>
</table>

Changes from baseline: (+) = increase from baseline functional index; (-) = decrease from baseline functional index; (*) = negligible or no change from baseline functional index

East Fork SFSR = East Fork South Fork Salmon River; FA = Functioning Appropriately; FR = Functioning at Risk; FUR = Functioning at Unacceptable Risk; N/A = not applicable; WCI = Watershed Condition Indicator; YPP = Yellow Pine pit

## Impacts to Chinook Salmon

Chinook salmon would be affected by the 2021 MMP through changes in water temperature and flow, which affects other factors such as productivity, intrinsic potential, and Critical Habitat. The effects to Chinook salmon are described below.

### Water Temperature

Water temperature is an important factor affecting the survival of each Chinook salmon life stage. The accepted stream temperature thresholds/ranges for life stages were compiled from regulatory standards and other relevant literature (ESS 2019a). ESS (2019a) presents quantification of baseline habitat availability (in relation to stream temperature) for Chinook salmon and analyzes the likely effects of changes to stream temperatures on available habitat as a result of implementation of the SGP. The following is a summary of the analysis and potential impacts from water temperature changes in streams at the mine site (ESS 2019a).
The highest modeled temperatures (i.e., maximum weekly summer temperatures) from SPLNT modeling (Brown and Caldwell 2021i) for a stream reach were compared to accepted stream temperature thresholds/ranges to determine the baseline length of available habitat. Predicted stream temperatures from SPLNT modeling were used to forecast the potential changes to the amount of available habitat for each life stage for multiple Mine Years. Note that the SPLNT model did not consider the effects of climate change; modeled temperature results would likely be higher if climate change had been a factor in the model.

Table 4.12-7 presents the length of usable IP habitat that fall within the temperature threshold categories for Chinook salmon adult migration and early life stages, and length of Critical Habitat for juvenile rearing that fall within the temperature thresholds. Length of habitat for Chinook salmon adult migration and juvenile rearing are based the amount of habitat with suitable thermal conditions using the summer maximum temperatures, which applied a maximum weekly ‘constant’ temperature for July. Spawning and incubation/emergence apply the fall maximum temperature, which applied a maximum weekly ‘constant’ temperature for September while spawning and incubation/emergence apply the fall maximum temperature (ESS 2019a).

The adult migration and spawning life stages experience a reduction in habitat that meets the thermal requirements for Chinook salmon. These reductions are either due to water temperatures that are too high or too low for the specific life stage, or due to limited access to suitable habitat (e.g., Meadow Creek). Juvenile rearing life stage experiences increases in thermally suitable habitat. Relative to baseline conditions:

- There would be a decrease in habitat conditions for migrating adults upstream from the Yellow Pine pit lake cascade barrier that meet the temperature criteria because water temperatures are lower than the thermal requirements. These habitats are not volitionally available to Chinook salmon under baseline conditions. The impacts shown are based on water temperatures that are mostly lower than the thermal criteria. While the temperatures are typically lower than the criteria, migration would not be impaired.

- There would be a net decrease in thermally suitable spawning habitat both upstream and downstream from Yellow Pine pit lake cascade barrier during operations and post-closure due to a slightly warmer MWMT.

- There would be a net increase in thermally suitable habitat conditions for incubation and emergence during operations through post-closure both upstream and downstream from the Yellow Pine pit lake cascade barrier.

- There would be a net increase in thermally suitable juvenile rearing habitat during operations through post-closure.

Stream lengths identified in Table 4.12-7 assume Chinook salmon already occur upstream from the Yellow Pine pit lake; however, unless they are released by IDFG, Chinook salmon do not naturally occur. Therefore, while there is a decrease in thermally suitable habitat, they currently only occur in approximately 2 km of modeled habitat downstream from Yellow Pine pit.
Creeks in the mine site area do experience significant seasonal and diurnal variations, and for mobile life stages (i.e., adults and juveniles), if MWMTs are above the thresholds, fish may avoid areas within streams if they are able, such as finding thermal refuges. Through stream restoration and enhancement actions, stream cover and instream structures may provide thermal refugia.

Based on modeled results, the effects of the 2021 MMP on Chinook salmon caused by changes to temperature-based suitable habitat are expected to be minor, permanent, and localized; however, given Chinook salmon would be able to volitionally access habitat upstream from Yellow Pine pit, the effects of the 2021 MMP on Chinook salmon are expected to have minor, permanent, and localized but beneficial.

### Table 4.12-7 Length of Stream Habitat that Meets the Optimal Thermal Requirements for Chinook Salmon Under the 2021 MMP

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Base-line (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 22 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 32 (km)</th>
<th>Mine Year 52 (km)</th>
<th>Mine Year 112 (km)</th>
<th>Change from Baseline to Mine Year 112 (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Below Yellow Pine pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Migration¹</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adult Migration²</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Spawning³</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spawning⁴</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>0.73</td>
<td>0.73</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Incubation/Emergence</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.73</td>
<td>0.73</td>
<td>+0.73</td>
<td></td>
</tr>
<tr>
<td>Juvenile Rearing⁵</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td><strong>Above Yellow Pine pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Migration¹</td>
<td>2.43</td>
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<td>0.69</td>
<td>0.25</td>
<td>2.93</td>
<td>2.68</td>
<td>1.07</td>
<td>0</td>
<td>-2.43</td>
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<tr>
<td>Adult Migration²</td>
<td>7.48</td>
<td>3.35</td>
<td>4.25</td>
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<td>5.50</td>
<td>5.78</td>
<td>6.57</td>
<td>6.57</td>
<td>6.57</td>
<td>-0.91</td>
</tr>
<tr>
<td>Spawning³</td>
<td>1.51</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-1.51</td>
</tr>
<tr>
<td>Spawning⁴</td>
<td>10.92</td>
<td>6.85</td>
<td>8.02</td>
<td>9.91</td>
<td>9.91</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>-0.85</td>
</tr>
<tr>
<td>Incubation/Emergence</td>
<td>3.44</td>
<td>3.50</td>
<td>7.46</td>
<td>7.39</td>
<td>8.02</td>
<td>7.39</td>
<td>7.39</td>
<td>7.39</td>
<td>7.39</td>
<td>+3.95</td>
</tr>
<tr>
<td>Juvenile Rearing⁵</td>
<td>17.51</td>
<td>10.94</td>
<td>13.43</td>
<td>13.35</td>
<td>13.35</td>
<td>18.97</td>
<td>18.97</td>
<td>18.97</td>
<td>18.97</td>
<td>+1.46</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>10.92</td>
<td>6.85</td>
<td>8.02</td>
<td>9.91</td>
<td>9.91</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>-0.85</td>
</tr>
<tr>
<td></td>
<td>13.51</td>
<td>10.94</td>
<td>13.43</td>
<td>13.35</td>
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<td>18.97</td>
<td>18.97</td>
<td>18.97</td>
<td>18.97</td>
<td>+1.46</td>
</tr>
</tbody>
</table>

1 Results based on USEPA criteria for optimal swimming performance – 15-19°C
2 Results based on USEPA criteria for minimizing disease risk – 12-13°C and elevated disease risk 14-17°C
3 Results based on IDAPA criteria of 13°C maximum temperature for spawning
4 Results based on USEPA criteria of 1-14°C temperature for spawning
5 Results based on modeled Critical Habitat
6 Results based on usable IP habitat
Flow Productivity

A flow-productivity model was developed to examine the effects of predicted flow changes associated with the 2021 MMP on Chinook salmon productivity. Annual flow productivity was determined as the long-term percent change from the existing or baseline conditions for each mine year. To analyze the altered stream flow across the mine area, flow-productivity outputs were used from three of the USGS stream flow gages (East Fork SFSR above Sugar, East Fork SFSR at Stibnite, East Fork SFSR above Meadow) and lower Meadow Creek (MC-6).

Table 4.12-8 and Figure 4.12-4 show the average Chinook salmon flow-productivities for each stream flow site over pertinent periods throughout mine operations and post-closure. The greatest reduction in flow-productivity averaged over the long-term period (Mine Years -2 to 20) are in the East Fork SFSR upstream from Sugar Creek (-10.5 percent) and in Meadow Creek (-8.9 percent). Most of the Chinook salmon productivity on the East Fork SFSR upstream from Sugar Creek is greatly impacted by mine operations that alter stream flow over the life of the mine. Similarly, most of the productivity in Meadow Creek is greatly impacted by changes in stream flow caused by mine operations in Meadow Creek. The East Fork SFSR above Meadow Creek is less impacted by changes in stream flow post-closure.

Table 4.12-8  Percent Change in Chinook Salmon Productivity Relative to Baseline Productivity by Mine Year and Location

<table>
<thead>
<tr>
<th>Period</th>
<th>Mine Year</th>
<th>East Fork SFSR above Meadow Creek Confluence (USGS Gage 13310800)</th>
<th>East Fork SFSR at Stibnite (USGS Gage 13311000)</th>
<th>East Fork SFSR above Sugar Creek Confluence (USGS Gage 13311250)</th>
<th>Meadow Creek (MC-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Productivity)</td>
<td></td>
<td>1.06</td>
<td>1.06</td>
<td>1.06</td>
<td>1.06</td>
</tr>
<tr>
<td>Mine Years -2 to 20 (% Change)</td>
<td>-2</td>
<td>0.0%</td>
<td>2.0%</td>
<td>1.8%</td>
<td>3.9%</td>
</tr>
<tr>
<td></td>
<td>-1</td>
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<td>-3.3%</td>
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<td>-5.9%</td>
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<td>-15.9%</td>
<td>-10.8%</td>
</tr>
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<td>-9.3%</td>
<td>-1.7%</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>-0.6%</td>
<td>-15.7%</td>
<td>-19.5%</td>
<td>-23.4%</td>
</tr>
<tr>
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<td>-0.4%</td>
<td>-17.7%</td>
<td>-21.4%</td>
<td>-28.6%</td>
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<td>-7.4%</td>
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<td>-12.7%</td>
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<td>-13.1%</td>
<td>-8.0%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0.0%</td>
<td>-4.9%</td>
<td>-15.1%</td>
<td>-8.6%</td>
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<tr>
<td></td>
<td>11</td>
<td>0.0%</td>
<td>-4.9%</td>
<td>-14.5%</td>
<td>-8.6%</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>-0.6%</td>
<td>-5.4%</td>
<td>-10.0%</td>
<td>-9.4%</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>-2.5%</td>
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<td>-12.7%</td>
<td>-9.4%</td>
</tr>
<tr>
<td>Period</td>
<td>Mine Year</td>
<td>East Fork SFSR above Meadow Creek Confluence (USGS Gage 13310800)</td>
<td>East Fork SFSR at Stibnite (USGS Gage 13311000)</td>
<td>East Fork SFSR above Sugar Creek Confluence (USGS Gage 13311250)</td>
<td>Meadow Creek (MC-6)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>---------------------------------------------------------------</td>
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<tr>
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<td>-3.8%</td>
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<td>-11.4%</td>
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<tr>
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<td></td>
<td>17</td>
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<td>-5.3%</td>
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<td>18</td>
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<td>-3.5%</td>
<td>-4.5%</td>
</tr>
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<td>-3.4%</td>
</tr>
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<td>20</td>
<td>-1.0%</td>
<td>-1.6%</td>
<td>-1.6%</td>
<td>-0.6%</td>
</tr>
</tbody>
</table>

**Mine Years -2 to 20 Productivity (% Change from Baseline)**

- Minimum: 1.02 (-3.9%) 0.87 (-17.7%) 0.83 (-21.4%) 0.78 (-28.6%)
- Mean: 1.05 (-1.0%) 1.00 (-5.7%) 0.95 (-10.5%) 0.97 (-8.9%)
- Maximum: 1.06 (0.0%) 1.08 (2.0%) 1.08 (1.8%) 1.10 (3.9%)

**Post Closure (21 to 112) Productivity (% Change from Baseline)**

- Mean: 1.04 (-1.8%) 1.08 (1.8%) 1.07 (1.1%) 1.05 (-0.6%)

The Mine Years –2 to 20 were selected because stream flows equilibrate at Mine Year 20. Therefore, the post-closure value represents an average annual percent change in productivity for Mine Years 21 through 112.

Figure 4.12-4  Percent Change in Chinook Salmon Productivity from Baseline Conditions by Mine Year and Location (USGS Gaging Stations and MC-6)
Changes in Chinook productivity also occur from Mine Years 3 to 8, where productivity fluctuates in the East Fork SFSR above Meadow Creek, East Fork SFSR above Sugar Creek, and Meadow Creek locations (Table 4.12-8; Figure 4.12-4). This decrease in productivity occurs during periods of mine operations that result in dewatering. The increase in productivity in Mine Year 5 is due to reductions of water abstraction during operations from dewatering and subsequent filling of the Hangar Flats pit and dewatering of the Yellow Pine pit.

It is important to note that under baseline conditions, Chinook salmon do not volitionally occur upstream from the Yellow Pine pit lake cascade barrier. However, at Mine Year -1, the tunnel would be constructed allowing for volitional passage. For the Meadow Creek, East Fork SFSR at Stibnite, and East Fork SFSR above Sugar Creek sites, the effects of the 2021 MMP on Chinook salmon productivity are expected to be moderate, long-term (occurring during operations), and localized. For the East Fork SFSR above Meadow Creek site, the effects of the 2021 MMP on Chinook salmon productivity are expected to be minor, long-term (occurring during operations), and localized. Permanent effects from changes in productivity, that occur during the post-closure would be negligible across all of the mine site.

Intrinsic Potential
Throughout the construction period and life of the mine, the stream length of each ranking of IP model habitat were determined. Table 4.12-9 summarizes the years in which there is a large change in IP and includes total length of IP in the baseline conditions and at the end of the mine life.

Table 4.12-9 Stream Length with Intrinsic Potential Habitat for Chinook Salmon Throughout the Mine Life

<table>
<thead>
<tr>
<th>IP Rating</th>
<th>Baseline</th>
<th>Mine Year 3</th>
<th>Mine Year 5</th>
<th>Mine Year 6</th>
<th>Mine Year 11</th>
<th>Mine Year 15</th>
<th>Mine Years 23 to 112</th>
<th>Net Loss/Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Medium</td>
<td>0.66</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>-0.03</td>
</tr>
<tr>
<td>Low</td>
<td>4.29</td>
<td>4.26</td>
<td>4.26</td>
<td>4.26</td>
<td>4.83</td>
<td>4.83</td>
<td>4.83</td>
<td>+0.54</td>
</tr>
<tr>
<td>Negligible</td>
<td>1.05</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
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<tr>
<td>Total IP Habitat</td>
<td>6.00</td>
<td>5.68</td>
<td>5.68</td>
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<td>6.25</td>
<td>6.25</td>
<td>6.25</td>
<td>+0.25</td>
</tr>
<tr>
<td>Total Length of Habitat Evaluated</td>
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<td>28.35</td>
<td>28.35</td>
<td>28.35</td>
<td>28.92</td>
<td>28.92</td>
<td>28.92</td>
<td>-0.09</td>
</tr>
<tr>
<td>East Fork SFSR and Tributaries Upstream from Yellow Pine pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.66</td>
</tr>
<tr>
<td>Medium</td>
<td>0.9</td>
<td>0.31</td>
<td>1.66</td>
<td>0.31</td>
<td>0.31</td>
<td>1.66</td>
<td>2.45</td>
<td>+1.55</td>
</tr>
<tr>
<td>Low</td>
<td>1.21</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>-0.97</td>
</tr>
<tr>
<td>Negligible</td>
<td>0.1</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.1</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>2.86</td>
<td>0.55</td>
<td>1.89</td>
<td>0.55</td>
<td>0.55</td>
<td>1.89</td>
<td>2.68</td>
<td>-0.18</td>
</tr>
<tr>
<td>Total Length of Habitat Evaluated</td>
<td>16.93</td>
<td>15.53</td>
<td>15.53</td>
<td>15.53</td>
<td>15.53</td>
<td>15.53</td>
<td>15.69</td>
<td>-1.24</td>
</tr>
</tbody>
</table>

Stibnite Gold Project Supplemental Draft Environmental Impact Statement 4-362
### Intrinsic Potential Habitat (km)

#### East Fork SFSR and Tributaries between Yellow Pine pit and Sugar Creek

<table>
<thead>
<tr>
<th>IP Rating</th>
<th>Baseline</th>
<th>Mine Year 3</th>
<th>Mine Year 5</th>
<th>Mine Year 6</th>
<th>Mine Year 11</th>
<th>Mine Year 15</th>
<th>Mine Years 23 to 112</th>
<th>Net Loss/Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Medium</td>
<td>0.18</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.18</td>
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<tr>
<td>Low</td>
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<td>0.35</td>
<td>0.35</td>
<td>1.26</td>
<td>1.26</td>
<td>1.26</td>
<td>+0.42</td>
</tr>
<tr>
<td>Negligible</td>
<td>0.15</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>-0.03</td>
</tr>
<tr>
<td>Total IP Habitat</td>
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<td>0.47</td>
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<td>1.38</td>
<td>1.38</td>
<td>+0.21</td>
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<tr>
<td>Total Length of Habitat Evaluated</td>
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<td>4.47</td>
<td>4.47</td>
<td>4.47</td>
<td>3.45</td>
<td>3.45</td>
<td>3.45</td>
<td>-0.89</td>
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</table>

#### East Fork SFSR Downstream from Sugar Creek

<table>
<thead>
<tr>
<th>IP Rating</th>
<th>Baseline</th>
<th>Mine Year 3</th>
<th>Mine Year 5</th>
<th>Mine Year 6</th>
<th>Mine Year 11</th>
<th>Mine Year 15</th>
<th>Mine Years 23 to 112</th>
<th>Net Loss/Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Medium</td>
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<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
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<tr>
<td>Negligible</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
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<tr>
<td>Total IP Habitat</td>
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<td>1.11</td>
<td>1.11</td>
<td>1.11</td>
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#### Headwaters East Fork SFSR Subwatershed

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Mine Year 3</th>
<th>Mine Year 5</th>
<th>Mine Year 6</th>
<th>Mine Year 11</th>
<th>Mine Year 15</th>
<th>Mine Years 23 to 112</th>
<th>Net Loss/Gain</th>
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</thead>
<tbody>
<tr>
<td>Total IP Habitat</td>
<td>2.28</td>
<td>1.58</td>
<td>1.58</td>
<td>1.58</td>
<td>2.49</td>
<td>2.49</td>
<td>2.49</td>
<td>+0.21</td>
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<tr>
<td>Below Yellow Pine pit</td>
<td>8.86</td>
<td>6.23</td>
<td>7.57</td>
<td>6.23</td>
<td>6.8</td>
<td>8.14</td>
<td>8.93</td>
<td>+0.07</td>
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<tr>
<td>Above Yellow Pine pit</td>
<td>11.15</td>
<td>7.81</td>
<td>9.15</td>
<td>7.81</td>
<td>9.29</td>
<td>10.63</td>
<td>11.42</td>
<td>+0.28</td>
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Km = kilometer; East Fork SFSR = East Fork South Fork Salmon River; IP = Intrinsic Potential

Throughout the life of the mine, most of the changes to IP habitat for Chinook salmon cause major or moderate negative impacts. By Mine Year 3, Meadow Creek would lose all the high and negligible IP and over half the medium and low-quality IP habitat because the mining activities along the TSF would block fish access. Additionally, physical modification of ground surface in the vicinity of the East Fork SFSR causes a loss of medium, low, and negligible quality IP habitat just upstream of Midnight Creek. During Mine Year 5 operational changes at Yellow Pine pit cause flow increases in Meadow Creek drastically raising the medium quality IP habitat however in Mine Year 6 flows return to similar to before reducing medium IP back down again in Mine Year 6. By Mine Year 11, the East Fork SFSR regains some low-quality IP habitat above Midnight Creek due to the start of reclamation and the end of physical modifications of ground surface in the vicinity of East Fork SFSR. By Mine Year 15 and Mine Year 18, Meadow Creek gains back a significant amount of medium quality IP habitat due to dewatering pumping stopping. Finally, by the end of the mine life, the IP habitat stays the same as Mine Year 18 due to presumed wetted widths in the restored stream channels (designed wetted width slightly less than 3.6 m compared to greater than or equal to 3.6 m wetted width required for Chinook salmon).
The IP model does not take current species presence or physical barriers into account, even if the evaluated stream segments are considered usable IP habitat. It is important to note that Chinook salmon do not naturally occur upstream of Yellow Pine pit. Chinook salmon have been periodically translocated upstream of Yellow Pine pit by the IDFG and the Nez Perce Tribe. While there is 11.15 km of usable IP habitat in baseline conditions, only 2.28 km or 20.4 percent of that IP habitat is in stream segments where Chinook salmon naturally occur. In addition, the only high IP habitat found in baseline conditions was in Meadow Creek, some of which is blocked by a physical barrier. By Mine Year 112, 0.21 km or 17.9 percent of the IP habitat downstream of Yellow Pine pit would be gained. Upstream of Yellow Pine pit, 0.07 km or an additional 0.79 percent of IP habitat would be gained and all high IP habitat would be lost. Notably, most of the medium IP that remains in Meadow Creek at Mine Year 23 is also blocked by a physical barrier to Chinook salmon so is not accessible.

Overall, the SGP area gains a length of 0.28 km with Chinook salmon IP habitat by the end of the life of the mine. Meadow Creek has a net loss of 0.18 km, primarily in the portion of Meadow Creek where the TSF would be placed, while all other areas have no overall change or have slight increases. The total changes to IP habitat are as follows: medium IP habitat is increased by 77 percent (1.34 km), less than 1 percent (0.01 km) of low IP habitat is lost, 100 percent (0.66 km) of high IP habitat is lost, and 31 percent (0.40 km) of negligible IP is lost. This equates to a 2 percent (0.28 km) gain of the total IP habitat for Chinook salmon. The long-term changes of IP habitat in Meadow Creek for Chinook salmon are an impact due to the loss of IP habitat, particularly through the placement of the TSF over Meadow Creek. Although there is a loss of habitat in Meadow Creek, there is an overall minor, permanent, increase in IP habitat and a small addition of new low IP habitat on the East Fork SFSR between the Yellow Pine pit and Sugar Creek.

It is important to note that under baseline conditions, Chinook salmon do not volitionally occur upstream from the Yellow Pine pit lake cascade barrier. The effects of the SGP on Chinook salmon IP habitat are expected to be moderate and localized impacts during the mining years, but minor, permanent, and localized benefits post-closure.

Critical Habitat

Critical Habitat for Chinook salmon in the active mine area would be impacted by various activities including active mining, diversions, barrier removal, and stream restoration. The impacts would be related to physical stream channel changes, accidental hazardous material spills, and changes in WCIs – most importantly barriers, stream flow, and water temperature. Chinook salmon Critical Habitat outside the mine site also would be directly affected by culvert installations and would be at risk of accidental hazardous materials spills in the streams adjacent to the access roads.

Access road culvert replacements and new culverts would cause temporary disturbances of Critical Habitat and increase the risk of erosion and sedimentation. The transportation of hazardous materials on access roads and throughout the mine site would increase the risk of spills adjacent to Critical Habitat or in streams/rivers that flow into Critical Habitat in the East Fork SFSR, Johnson Creek, and streams adjacent to Warm Lake Road (CR 10-579). A total of 18 km of Chinook salmon Critical Habitat along the Burntlog Route would be at risk.
An analysis of modeled Critical Habitat currently blocked due to passage barriers indicates that the largest impacts to Critical Habitat for Chinook salmon would come from barrier removal. Nearly 26 km of Critical Habitat are blocked above the Yellow Pine pit cascade barrier, with just over 23 km upstream from the box culvert in the East Fork SFSR under baseline conditions (Figure 4.12-2). These barriers would be removed as early as Mine Year -1 to provide upstream access for Chinook salmon. Activities on Meadow Creek would eliminate potential access to much of the stream, including over 6.6 km of modeled Critical Habitat.

It is important to note that under baseline conditions, Chinook salmon do not volitionally occur upstream from the Yellow Pine pit lake cascade barrier. Overall, there would be a localized, permanent, major beneficial effect on access to Critical Habitat for Chinook salmon.

Integration of Effects

The combination of physical stream channel changes, direct effects to individuals, and changes to many of the WCIs (e.g., temperature, stream flow) would affect Chinook salmon and habitat in the analysis area under the 2021 MMP. SGP activities that would potentially cause these impacts include, but are not limited to, new road construction, transportation including hazardous materials, stream diversions, and construction and operation activities at the mine site. These effects may cause injury or mortality to individuals and temporarily or permanently displace Chinook salmon from several mine site streams during certain periods when habitat conditions become unsuitable. This would cause a temporal loss of habitat. A summary of the overall net effects to Chinook salmon habitat and specific points regarding the impacts are provided below.

- Changes to water chemistry would primarily have minor effects but would have an unknown level of beneficial effects through the reduction of arsenic and antimony.

- Alterations of the physical structures of the East Fork SFSR and Meadow Creek would result in a net benefit to Chinook salmon. The construction of the fishway, with a later restoration of the East Fork SFSR, would provide volitional access to spawning and rearing habitat that was only accessible when fish were transplanted by IDFG. Additional enhancements to the East Fork SFSR and Meadow Creek would provide additional habitat benefits.

- While there is a modeled loss of thermally-suitable habitat for adult migration of Chinook, this is primarily caused by water temperatures below the temperature criteria, which would not result in impaired movement. Spawning, both upstream and downstream from the YPP and juvenile rearing downstream from the YPP would experience a slight decrease in thermally-suitable habitat downstream from YPP. However, the expansion of habitat availability through the addition of the fishway and the subsequent stream channel restoration provides access to additional spawning and rearing habitat. Diurnal variations will provide reprieves from warmer temperatures and improved habitat structures/enhancements will provide refuges that may provide thermal refugia.

- Changes in flows would result in a net decrease in productivity between baseline conditions and post-closure conditions. Activities during mine operations would result in major reductions in flows and in Chinook salmon flow-based productivity in the East Fork SFSR between Meadow
Creek and Sugar Creek, and in Meadow Creek. The predicted decreases in Chinook salmon productivity during mine operations compared to baseline conditions would be greater than 10 percent in the East Fork SFSR between YPP and Sugar Creek and nearly 9 percent in lower Meadow Creek, and over 5 percent in the East Fork SFSR near Stibnite. There would, as a result, be a net decrease in flow-productivity, particularly for the spawning life stage caused by a reduction in flow. In subsequent years, closure and post-closure periods, would have negligible to minor changes in productivity.

- The removal of barriers would provide access to upstream habitat not previously volitionally accessed. This would result in a net benefit to Chinook salmon. A new barrier would be constructed in Meadow Creek along the TSF; however, this is not a section of Meadow Creek in which Chinook salmon are able to volitionally reach.

- There would be a slight net increase in IP habitat for Chinook salmon. Post-closure, there would be a net increase of approximately 0.28 km (2 percent) of useable habitat in the headwaters of the East Fork SFSR. This is a change from approximately 11.15 km at baseline to 11.42 km in Mine Year 23. The majority of the usable IP habitat identified in the analysis area is habitat not previously volitionally accessed.

- There would be a net increase in access to Chinook salmon Critical Habitat. While construction and mining activities would affect individual fish and may affect the habitat through the introduction of sediment and contaminants, there would be an increase from access to upstream habitat that was not previously volitionally accessible.

Following closure and reclamation, the overall net effect from the SGP would be a net increase in available habitat, however, flows and temperatures make the additional habitat less optimal.

**Impacts to Steelhead**

Steelhead would be affected by the 2021 MMP through changes in water temperature and flow, which affects other factors such as productivity, intrinsic potential, and Critical Habitat. The effects to steelhead are described below.

**Water Temperature**

The following is a summary of the analysis and potential impacts from water temperature changes in streams at the mine site from ESS 2019a.

**Table 4.12-10** presents the length of intrinsic potential habitat that fall within the temperature threshold categories for steelhead life stages. Length of habitat for steelhead egg incubation/emergence and juvenile rearing are based the amount of habitat with suitable thermal conditions using the summer maximum temperatures. The other life stages are outside the summer – fall modeled parameters, and therefore are not included in the analysis.

As shown in **Table 4.12-10**, there would be no reduction in habitat that meets the thermal requirements for steelhead. Relative to baseline conditions:
• There would be no loss of suitable conditions for egg incubation/emergence.

• There would be a net increase in suitable rearing habitat during operations and post-closure, even with a loss of suitable rearing habitat conditions downstream from the Yellow Pine pit lake cascade barrier.

Based on modeled results, the effects of the 2021 MMP on steelhead caused by changes to temperature-based suitable habitat are expected to be moderate, permanent, and localized, with beneficial effects resulting from increased access to habitats not previously accessible.

**Table 4.12-10 Length of Stream Habitat that Meets the Optimal Thermal Requirements for Steelhead Under the 2021 MMP**

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Baseline (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 22 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 32 (km)</th>
<th>Mine Year 52 (km)</th>
<th>Mine Year 112 (km)</th>
<th>Change from Baseline to Mine Year 112 (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Below Yellow Pine pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubation/</td>
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<td>0</td>
<td>0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile Rearing</td>
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<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Total Available Habitat</td>
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<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td><strong>Above Yellow Pine pit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Incubation/</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Emergence</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile Rearing</td>
<td>0</td>
<td>8.52</td>
<td>9.35</td>
<td>9.91</td>
<td>9.91</td>
<td>9.28</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>+10.07</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>0</td>
<td>8.52</td>
<td>9.35</td>
<td>9.91</td>
<td>9.91</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>10.07</td>
<td>+10.07</td>
</tr>
</tbody>
</table>

km- kilometer

**Flow Productivity**

A flow-productivity model was developed to examine the effects of predicted flow changes associated with the 2021 MMP on steelhead productivity. Annual flow productivity was determined as the long-term percent change from the existing or baseline conditions for each mine year. To analyze the altered stream flow across the project area, flow-productivity outputs were used from three of the USGS stream flow gages (East Fork SFSR above Sugar, East Fork SFSR at Stibnite, East Fork SFSR above Meadow) and the lower Meadow Creek (MC-6).

**Table 4.12-11 and Figure 4.12-5** shows the average steelhead productivities for each stream flow site over pertinent periods throughout mine operations and post-closure. The greatest, negative percent changes in flow-productivity averaged over the long-term period (Mine Years -2 to 20) are in the East
Fork SFSR upstream from Sugar Creek (-11.2 percent) and in Meadow Creek (-13.6 percent). Most of the steelhead productivity on the East Fork SFSR upstream from Sugar Creek is greatly impacted by mine operations that alter streamflow over the life of the mine. Similarly, most of the productivity in Meadow Creek is greatly impacted by changes in stream flow caused by mine operations in Meadow Creek. The East Fork SFSR above Meadow Creek is less impacted by changes in stream flow over the long-term. Similarly, most of the steelhead productivity throughout the mine area is minimally affected by altered stream flow post-closure.

Changes in steelhead productivity also occur from Mine Years 3 to 8, where productivity fluctuates in the East Fork SFSR above Meadow Creek, East Fork SFSR above Sugar Creek, and Meadow Creek locations (Table 4.12-11, Figure 4.12-5). The negative percent changes in productivity occur during periods of mine operations that result in dewatering. The increase in productivity in Mine Year 5 is due to reductions of water abstraction during operations from dewatering and subsequent filling of the Hangar Flats pit and dewatering of the Yellow Pine pit.

It is important to note that under baseline conditions, steelhead do not volitionally occur upstream from the Yellow Pine pit lake cascade barrier. However, at Mine Year -1, the tunnel is constructed allowing for volitional passage. At the Meadow Creek, East Fork SFSR at Stibnite, and East Fork SFSR above Sugar Creek sites, the effects of the 2021 MMP on steelhead productivity are expected to be moderate, permanent, and localized. For the East Fork SFSR above Meadow Creek site, the effects of the SGP on steelhead productivity are expected to be minor, long-term (occur during mining operations), and localized. Permanent effects from changes in productivity, which occur during the post-closure are negligible across the mine site area.

Figure 4.12-5  Percent Change in Steelhead Productivity from Baseline Conditions by Mine Year and Location (USGS Gaging Stations and MC-6)
### Table 4.12-11 Percent Change in Steelhead Productivity Relative to Baseline Productivity by Mine Year and Location

<table>
<thead>
<tr>
<th>Period</th>
<th>Mine Year</th>
<th>East Fork SFSR above Meadow Creek (USGS Gage 13310800)</th>
<th>East Fork SFSR at Stibnite (USGS Gage 13311000)</th>
<th>East Fork SFSR above Sugar Creek (USGS Gage 13311250)</th>
<th>Meadow Creek (MC-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Productivity)</td>
<td></td>
<td>1.24</td>
<td>1.24</td>
<td>1.24</td>
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<tr>
<td>-2</td>
<td>0%</td>
<td>0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>0%</td>
<td>-4.8%</td>
<td>-4.4%</td>
<td>-8.1%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0%</td>
<td>-9.0%</td>
<td>-9.0%</td>
<td>-17.0%</td>
<td></td>
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<tr>
<td>2</td>
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<td>-20.9%</td>
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<td>3</td>
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<td>-10.4%</td>
<td>-21.1%</td>
<td>-19.0%</td>
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</tr>
<tr>
<td>4</td>
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<td>-18.0%</td>
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</tr>
<tr>
<td>5</td>
<td>-0.2%</td>
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</tr>
<tr>
<td>6</td>
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</tr>
<tr>
<td>9</td>
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<td>-16.7%</td>
<td>-13.6%</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0%</td>
<td>-7.0%</td>
<td>-19.4%</td>
<td>-11.9%</td>
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<td>11</td>
<td>0%</td>
<td>-7.8%</td>
<td>-20.0%</td>
<td>-14.0%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0%</td>
<td>-7.7%</td>
<td>-10.1%</td>
<td>-13.8%</td>
<td></td>
</tr>
<tr>
<td>13</td>
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<td>-7.0%</td>
<td>-14.0%</td>
<td>-12.1%</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>-0.8%</td>
<td>-7.9%</td>
<td>-13.8%</td>
<td>-12.7%</td>
<td></td>
</tr>
<tr>
<td>15</td>
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<tr>
<td>16</td>
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</tr>
<tr>
<td>18</td>
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<td>-3.3%</td>
<td>-1.2%</td>
<td>-9.2%</td>
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</tr>
<tr>
<td>19</td>
<td>-1.8%</td>
<td>-3.2%</td>
<td>-3.4%</td>
<td>-4.6%</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2.4%</td>
<td>-2.6%</td>
<td>0.2%</td>
<td>-8.5%</td>
<td></td>
</tr>
<tr>
<td>Mine Years -2 to 20 (%) Change</td>
<td></td>
<td>Min 1.21 (-1.8%)</td>
<td>1.02 (-17.6%)</td>
<td>0.98 (-21.1%)</td>
<td>0.88 (-29.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean 1.24 (0.0%)</td>
<td>1.14 (-7.6%)</td>
<td>1.10 (-11.2%)</td>
<td>1.02 (-13.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max 1.26 (2.4%)</td>
<td>1.24 (0.0%)</td>
<td>1.24 (0.2%)</td>
<td>1.24 (0.0%)</td>
</tr>
<tr>
<td>Post Closure 21 to 112 (%) Change from Baseline</td>
<td></td>
<td>Mean 1.24 (0.7%)</td>
<td>1.27 (2.3%)</td>
<td>1.29 (4.2%)</td>
<td>1.24 (-0.2%)</td>
</tr>
</tbody>
</table>

The Mine Years –2 to 20 were selected because stream flows equilibrate at Mine Year 20. Therefore, the post-closure value represents an average annual percent change in productivity for Mine Years 21 through 112.
Intrinsic Potential

Throughout the construction period and life of the mine, the length of each ranking of IP habitat were determined. Table 4.12-12 summarizes the years in which there is a large change in IP and includes total IP habitat length in the baseline conditions and at the end of the mine life.

Table 4.12-12 Stream Length with Intrinsic Potential Habitat for Steelhead Throughout the Mine Life

<table>
<thead>
<tr>
<th>IP Rating</th>
<th>Intrinsic Potential Habitat by Mine Year (km)</th>
<th>Net Loss/Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>-2</td>
</tr>
<tr>
<td>East Fork SFSR and Tributaries Upstream from Yellow Pine pit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>2.16</td>
<td>2.16</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
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<tr>
<td>Low</td>
<td>2.91</td>
<td>2.88</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>5.07</td>
<td>5.04</td>
</tr>
<tr>
<td>Total Length Habitat Evaluated</td>
<td>29.01</td>
<td>28.35</td>
</tr>
<tr>
<td>Meadow Creek and EFMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>2.18</td>
<td>1.30</td>
</tr>
<tr>
<td>Medium</td>
<td>0.60</td>
<td>0.46</td>
</tr>
<tr>
<td>Low</td>
<td>0.87</td>
<td>0.09</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>3.65</td>
<td>1.85</td>
</tr>
<tr>
<td>Total Length Habitat Evaluated</td>
<td>16.93</td>
<td>15.75</td>
</tr>
<tr>
<td>East Fork SFSR and Tributaries between Yellow Pine pit and Sugar Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.18</td>
<td>0.12</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>0.72</td>
<td>0.23</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>0.90</td>
<td>0.35</td>
</tr>
<tr>
<td>Total Length Habitat Evaluated</td>
<td>4.34</td>
<td>4.47</td>
</tr>
<tr>
<td>East Fork SFSR Downstream from Sugar Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>1.02</td>
<td>1.02</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Total Length Habitat Evaluated</td>
<td>1.11</td>
<td>1.11</td>
</tr>
<tr>
<td>Headwaters East Fork SFSR Subwatershed</td>
<td></td>
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</tr>
<tr>
<td>Total IP Habitat Below Yellow Pine pit</td>
<td>1.95</td>
<td>1.40</td>
</tr>
<tr>
<td>Total IP Habitat Above Yellow Pine pit</td>
<td>8.72</td>
<td>6.90</td>
</tr>
<tr>
<td>Total IP Habitat</td>
<td>10.67</td>
<td>8.30</td>
</tr>
</tbody>
</table>
Throughout the life of the mine, most of the changes to IP habitat for steelhead result in moderate positive or negative impacts. In Mine Year -1 when the diversion of Meadow Creek occurs, Meadow Creek would lose some high, and most medium and low-quality IP habitat. Additionally, in Mine Year -1, the Yellow Pine pit tunnel construction causes a slight decrease of IP habitat in the East Fork SFSR and tributaries between Yellow Pine pit and Sugar Creek. In Mine Year 3, all medium quality IP habitat is lost, however, 0.59 km of high IP habitat in lower Meadow Creek is added due to an increased bankfull width. Physical modification of ground surface in the vicinity of the East Fork SFSR causes a loss of low IP habitat just upstream of Midnight Creek. In Mine Year 11, the East Fork SFSR regains some low IP habitat above Midnight Creek due to reclamation starting and physical modifications of ground surface in the vicinity of East Fork SFSR end. By Mine Year 18, Meadow Creek gains back high IP habitat due to cessation of dewatering pumping. Finally, at Mine Year 23, Meadow Creek regains additional medium and high-quality IP habitat.

IP does not factor in the actual species presence or physical barriers, but only whether the stream segments are considered usable IP habitat. It is important to note that, under baseline conditions, steelhead do not occur upstream from Yellow Pine pit, and there is a physical barrier to fish in Meadow Creek. While there is 10.67 km of IP habitat in baseline conditions, only 1.95 km or 18.2 percent of that is in stream habitat in which steelhead do currently occur. However, by Mine Year -1 the tunnel construction will allow steelhead access to EFSFSR and its tributaries upstream of the YPP. By Mine Year 23, 1.77 km of IP habitat would be gained from baseline, providing 12.44 km of potential rearing and spawning habitat above and below YPP for steelhead. Within this 12.44 km of IP habitat, a physical barrier blocks 2.62 km of the 4.51 km of IP habitat in Meadow Creek so it would still be inaccessible to steelhead.

Overall, the SGP area gains 1.77 km of steelhead IP habitat by Mine Year 23. Within that gain of IP habitat, high quality IP habitat increased by 18 percent, medium quality IP habitat increased by 112 percent, and low-quality IP habitat increased by 2 percent relative to baseline conditions. This equates to an overall 16.5 percent gain in IP habitat for steelhead. Prior to Mine Year 23, the long-term changes in IP habitat for steelhead have a moderate positive impact in lower Meadow Creek and East Fork SFSR between Meadow Creek and Yellow Pine pit and a major negative impact in upper Meadow Creek and East Fork SFSR between Yellow Pine pit and Sugar Creek. The permanent changes in IP habitat for steelhead have a moderate positive impact. While permanent impacts are mostly positive due to IP habitat improvements in Meadow Creek, there is a moderate permanent impact in upper Meadow Creek.

It is important to note that under baseline conditions, steelhead do not volitionally occur upstream from the Yellow Pine pit lake cascade barrier. Once the tunnel fishway construction and subsequent channel restoration are completed, steelhead will be able to access habitat upstream of YPP except for part of Meadow Creek upstream of a barrier. Overall, the SGP is expected to result in moderate, permanent, and localized benefits to steelhead IP habitat.

**Critical Habitat**

There is no steelhead trout Critical Habitat upstream from the Yellow Pine pit cascade barrier, but there is Critical Habitat below the barrier. Impacts from 2021 MMP activities at the mine site and those caused by the access roads, transmission lines, or off-site facilities could impact steelhead Critical Habitat. Access road culvert replacements and new culverts would cause temporary disturbances of Critical Habitat and
increase the risk of erosion and sedimentation. The transportation of hazardous materials on access roads and throughout the mine site would increase the risk of spills adjacent to Critical Habitat or in streams/rivers that flow into Critical Habitat in the East Fork SFSR, Johnson Creek, and streams adjacent to Warm Lake Road (CR 10-579). A total of 18 km of steelhead Critical Habitat along the Burntlog Route could be affected.

The gradient barrier at the Yellow Pine pit lake cascade is currently restricting access for steelhead trout to habitat upstream. However, no Critical Habitat is identified for steelhead trout upstream of the barrier. The removal of the Yellow Pine pit barrier at Mine Year -1, would provide access to fish to naturally move upstream. This would create a gain in quantity and quality of available habitat regardless of the lack of identified Critical Habitat for steelhead trout upstream of the Yellow Pine pit barrier.

Overall, the effects of the 2021 MMP are expected to result in minor, long-term, and localized impacts to the steelhead Critical Habitat.

Integration of Effects

The combination of physical stream channel changes, direct effects to individuals, and changes to many of the WCIs would affect steelhead and habitat under the 2021 MMP. These effects may cause injury or mortality to individuals and temporarily or permanently displace steelhead from several mine site streams during certain periods when habitat conditions become unsuitable. This would cause a temporal loss of habitat during mine operations.

A summary of the overall net effects to steelhead habitat and specific points regarding the impacts are provided below.

- Changes to water chemistry would primarily have minor effects but would have an unknown level of beneficial effects through the reduction of arsenic and antimony.
- Alterations of the physical structures of the East Fork SFSR and Meadow Creek would result in a net benefit to steelhead. The construction of the fishway, with a later restoration of the East Fork SFSR, would provide volitional access to habitat that was not previously accessible (nearly 9 km). Additional enhancements to the East Fork SFSR and Meadow Creek would provide additional habitat benefits.
- There is a modeled substantial increase in thermally-suitable habitat for juvenile rearing. There is no thermally-suitable habitat for egg incubation and emergence under either baseline conditions or the 2021 MMP, so no net loss. Additionally, steelhead would have access to upstream spawning and rearing habitat, which were not previously accessible.
- Changes in flows would result in a net decrease in productivity between baseline conditions and post-closure conditions. Activities during mine operations would result in major reductions in flows and in steelhead flow-based productivity in the East Fork SFSR between Meadow Creek and Sugar Creek, and in Meadow Creek. There would be a net decrease in steelhead habitat in Meadow Creek, but most flows would return to near baseline conditions in the East Fork SFSR after mine closure and post-closure. In subsequent years, closure and post-closure periods, would have negligible to minor changes in productivity.
• The removal of barriers would provide access to upstream habitat not previously volitionally accessed. This would result in a net benefit to steelhead. A new barrier would be constructed in Meadow Creek along the TSF; however, this is not a section of Meadow Creek in which steelhead are able to volitionally reach.

• There would be a slight net increase in IP habitat for steelhead. Post-closure, there would be a net increase of approximately 1.77 km (16.5 percent) of useable habitat in the headwaters of the East Fork SFSR. This is a change from approximately 10.67 km at baseline to 12.44 km in Mine Year 23. The majority of the usable IP habitat identified in the analysis area is habitat not previously volitionally accessed.

• There would be no change in access to steelhead Critical Habitat because there is no assumed Critical Habitat upstream from the Yellow Pine pit lake. Following the establishment of passage into the upper watershed, NMFS may designate Critical Habitat in the upper watershed.

Following closure and reclamation, the net effect would be an increase in both the quantity and quality of habitat for steelhead trout.

**Impacts to Bull Trout**

Bull trout would be affected by the 2021 MMP through changes in water temperature and flow, which affects other factors such as habitat through WUA, occupancy probability, and Critical Habitat. The effects to bull trout are described below.

**Water Temperature**

Water temperature is an important factor affecting the survival of each bull trout life stage. The accepted stream temperature thresholds/ranges for life stages of bull trout were compiled from regulatory standards and other relevant literature and are presented in Table 4 in ESS 2019a. The technical memorandum presents quantification of baseline habitat availability (in relation to stream temperature) for bull trout and analyzes the likely effects of changes to stream temperatures on available habitat as a result of implementation of the SGP. The following is a summary of the analysis and potential impacts from water temperature changes in streams at the mine site.

*Table 4.12-13* presents the length of streams that have positive bull trout occupancy probability that fall within the temperature threshold categories for bull trout life stages. Length of habitat for bull trout juvenile rearing are based the amount of habitat with suitable thermal conditions using the summer maximum temperatures, while spawning and incubation/emergence apply the fall maximum temperature. Detailed data for bull trout under the 2021 MMP are presented in the update of ESS 2019a.
Table 4.12-13 Length of Stream Habitat Under the Watershed Condition Indicator Categories for Water Temperatures for Bull Trout Under the 2021 MMP

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Baseline (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 22 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 32 (km)</th>
<th>Mine Year 52 (km)</th>
<th>Mine Year 112 (km)</th>
<th>Change from Baseline to Mine Year 112 (km)</th>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td>Below Yellow Pine pit</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spawning – FA</td>
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<td>0.05</td>
<td>0.05</td>
<td>+0.05</td>
<td></td>
</tr>
<tr>
<td>Spawning - FUR</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Incubation/Emergence - FA</td>
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<tr>
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<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
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<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Juvenile Rearing - FR</td>
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<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
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<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>+1.66</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-2.01</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Above Yellow Pine pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spawning – FA</td>
<td>1.62</td>
<td>1.42</td>
<td>2.61</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>-0.20</td>
</tr>
<tr>
<td>Spawning – FR</td>
<td>7.76</td>
<td>6.28</td>
<td>8.24</td>
<td>5.55</td>
<td>6.18</td>
<td>6.34</td>
<td>6.34</td>
<td>6.34</td>
<td>6.34</td>
<td>-1.42</td>
</tr>
<tr>
<td>Spawning - FUR</td>
<td>14.82</td>
<td>8.64</td>
<td>5.85</td>
<td>10.78</td>
<td>10.15</td>
<td>8.29</td>
<td>8.29</td>
<td>8.29</td>
<td>8.29</td>
<td>-6.52</td>
</tr>
<tr>
<td>Incubation/Emergence - FA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Incubation/Emergence - FUR</td>
<td>24.2</td>
<td>16.34</td>
<td>16.70</td>
<td>17.75</td>
<td>17.75</td>
<td>16.05</td>
<td>16.05</td>
<td>16.05</td>
<td>16.05</td>
<td>-8.15</td>
</tr>
<tr>
<td>Juvenile Rearing - FA</td>
<td>12.16</td>
<td>10.35</td>
<td>9.90</td>
<td>7.60</td>
<td>7.88</td>
<td>7.76</td>
<td>7.76</td>
<td>7.76</td>
<td>7.76</td>
<td>-4.4</td>
</tr>
<tr>
<td>Juvenile Rearing - FR</td>
<td>9.60</td>
<td>5.99</td>
<td>6.55</td>
<td>9.45</td>
<td>9.62</td>
<td>5.36</td>
<td>5.60</td>
<td>7.22</td>
<td>8.29</td>
<td>-1.31</td>
</tr>
<tr>
<td>Juvenile Rearing - FUR</td>
<td>2.43</td>
<td>0</td>
<td>0.25</td>
<td>0.69</td>
<td>0.25</td>
<td>2.93</td>
<td>2.68</td>
<td>1.07</td>
<td>0</td>
<td>-2.43</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>24.2</td>
<td>16.34</td>
<td>16.70</td>
<td>17.75</td>
<td>17.75</td>
<td>16.05</td>
<td>16.05</td>
<td>16.05</td>
<td>16.05</td>
<td>-8.15</td>
</tr>
</tbody>
</table>

km = kilometer; FA = functioning appropriately; FR = functioning at risk; FUR = functioning at unacceptable risk
As shown in Table 4.12-13, all life stages experience a reduction in habitat that meets the thermal requirements for bull trout. These reductions are either due to water temperatures that are too high or too low for the specific life stage, or due to limited access to suitable habitat (e.g., Meadow Creek). Relative to baseline conditions:

- There would be a net decrease in thermally suitable conditions for spawning because water temperatures are higher than the thermal requirements. While there is a decrease in the amount of thermally suitable spawning habitat that is considered functioning at risk or functioning at unacceptable risk, there is also a decrease in spawning habitat functioning appropriately.

- There would be a net decrease in thermally suitable habitat functioning appropriately for egg incubation/emergence during operations and post-closure primarily due to the loss of access to the upper Meadow Creek.

- There would be a net decrease in thermally suitable juvenile rearing habitat functioning appropriately during operations through post-closure primarily due to the loss of access to the upper Meadow Creek.

Based on modeled results, the effects of the SGP on bull trout caused by changes to thermally suitable habitat are expected to be major, permanent, and localized.

**Weighted Usable Area (PHABSIM)**

A PHABSIM model was developed to predict how bull trout habitat changes based upon changes in stream flow associated with different stream reaches throughout the SGP. The PHABSIM data are approximately 30 years old and originated from another project. They represent available data that provide reference information and should not be viewed as directly transferable to the project site. Although the PHABSIM results do not explicitly predict changes in habitat associated with changes in flow related to the proposed project, they do provide data on how the model predicted similar reductions in flow at similar-sized creeks in close proximity would affect habitat for the different life stages of bull trout. The general relationship between the predicted changes in streamflow and the impact to habitat (i.e., WUA) at the mine sites is a general decrease in streamflow results in a general decrease in habitat for the adult and juvenile bull trout life stages.

Under the 2021 MMP, the largest impacts on low-flow discharge would be at Meadow Creek between Mine Year 2 and Mine Year 8. Over this time period, flows are predicted to decrease between 11 percent and 36 percent (Table 4.12-5; mean = 18 percent and median = 20 percent). Since Meadow Creek is a small stream, it is represented by Summit Creek (Stream Index 1; Table 6-R1). For Summit Creek, the PHABSIM results indicated an 87 percent reduction in discharge from 7.8 cfs to 1.0 cfs which would result in a 90 percent reduction in adult bull trout habitat. Juvenile bull trout results were slightly lower with an 89 percent reduction in juvenile bull trout habitat. The predicted reduction in adult habitat at Summit Creek associated with a reduction in flow from 7.8 cfs to 4.4 cfs (44 percent decrease) was predicted to equate with a 42 percent decline in adult bull trout habitat and similarly a 41 percent reduction in juvenile bull trout habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size. For Meadow Creek, the impacts on bull trout habitat are major, long-term, and localized.
For the East Fork SFSR above Sugar Creek site, which is represented by Sugar Creek, flows are predicted to decrease between Mine Years 1 and 14 ranging from 7 percent to 25 percent (Table 4.12-5; mean = 16 percent and median = 16 percent). For Sugar Creek, the PHABSIM results indicated a 90 percent reduction in discharge from 9.9 cfs to 1.0 cfs which would result in an 88 percent reduction in adult bull trout habitat. Juvenile bull trout habitat reduction results were slightly lower with a –87 percent reduction. The predicted reduction in adult habitat at Sugar Creek associated with a decrease in flow from 7.8 cfs to 4.4 cfs (44 percent) was predicted to equate to a 37 percent decline in adult bull trout habitat and similarly a 33 percent reduction in juvenile bull trout habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size. For East Fork SFSR above Sugar Creek, the impacts on bull trout habitat are major, long term, and localized.

For the East Fork SFSR at Stibnite site, which is represented by East Fork SFSR downstream from Sugar Creek, flows are predicted to decrease between Mine Years 2 and 8 ranging from 6 percent to 20 percent (Table 4.12-5; mean = 10 percent and median = 11 percent). For East Fork SFSR downstream from Sugar Creek, the PHABSIM results indicated a 60 percent reduction in discharge from 63 cfs to 25 cfs which would result in a 49 percent reduction in adult bull trout habitat. Juvenile bull trout habitat reduction results were slightly lower with a 45 percent reduction in juvenile bull trout habitat. The predicted reduction in adult habitat at Sugar Creek associated with a decrease in flow from 63 cfs to 44 cfs (30 percent) was predicted to equate to a 15 percent decline in adult bull trout habitat. Juvenile bull trout habitat reduction results were slightly lower with an 11 percent reduction in habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size. For the East Fork SFSR at Stibnite site, the impacts on bull trout habitat are moderate, long term, and localized.

Analysis of relevant PHABSIM modeling from the region indicates SGP discharge impacts on physical habitat would be major, long term, and localized.

**Occupancy Probability**

The OM is a tool used to determine the probability of a fish species occupying a particular stream reach (occupancy probability) and to predict changes in the probability given changes to site physical characteristics (Isaak et al. 2015, 2017). An OM was developed to quantify potential occupancy probability for bull trout (See ESS 2019f for additional information). The OM calculates occupancy probabilities based on the combination of three independent variables important to bull trout: stream flow, stream temperature, and channel slope. The continuous range of occupancy probabilities are represented as percentages, from 0 percent to 100 percent for each reach. Table 4.12-14 presents the OM-derived distance-weighted average occupancy probabilities for bull trout by stream reach under the 2021 MMP for six different time periods: Baseline (existing conditions), Mine Year 6 (approximately halfway through mine operations), Mine Year 12 (near the end of mine operations), Mine Year 18 (beginning of the closure and reclamation), Mine Year 27 (post-closure where water temperatures are the highest) and Mine Year 112 (post-closure).

Stream channel alterations in the East Fork SFSR and Meadow Creek would impact occupancy probabilities for bull trout in the mine area. The largest increase in bull trout occupancy probability occurs in the East Fork SFSR between Sugar Creek and the Yellow Pine pit lake in Mine Year 6 but decrease in Mine Year 12 and Mine Year 18 and starts to increase to Mine Year 112 (Table 4.12-14). The increase in
Mine Year 6 in the East Fork SFSR is primarily caused by a decrease in average water temperatures between mid-July and late September. Water temperatures have higher maximums, but also lower minimums during this period. During this time period, less water from Meadow Creek is flowing into the East Fork SFSR, which affects the daily temperature moderation. As a result, the lower average temperature results in a higher occupancy probability for bull trout in the East Fork SFSR between the Yellow Pine pit lake and Sugar Creek. The East Fork SFSR upstream of the Yellow Pine pit lake and the Meadow Creek drainage all have increased occupancy probabilities for bull trout over time.

Table 4.12-14 Distance Weighted Average of Occupancy Probabilities (in Percent) for Bull Trout Under the 2021 MMP

<table>
<thead>
<tr>
<th>Stream Reach</th>
<th>Baseline</th>
<th>Mine Year 6</th>
<th>Mine Year 12</th>
<th>Mine Year 18</th>
<th>Mine Year 27</th>
<th>Mine Year 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR upstream from Meadow Creek</td>
<td>8.4%</td>
<td>9.6%</td>
<td>9.5%</td>
<td>8.5%</td>
<td>9.8%</td>
<td>9.7%</td>
</tr>
<tr>
<td>Meadow Creek and EFMC</td>
<td>5.7%</td>
<td>6.9%</td>
<td>6.7%</td>
<td>7.8%</td>
<td>5.7%</td>
<td>8.7%</td>
</tr>
<tr>
<td>East Fork SFSR between Meadow Creek and Yellow Pine pit</td>
<td>10.1%</td>
<td>12.4%</td>
<td>15.2%</td>
<td>13.8%</td>
<td>13.1%</td>
<td>14%</td>
</tr>
<tr>
<td>East Fork SFSR Between Yellow Pine pit and Sugar Creek</td>
<td>15.3%</td>
<td>22.6%</td>
<td>12.4%</td>
<td>12.3%</td>
<td>13.3%</td>
<td>16.1%</td>
</tr>
</tbody>
</table>

A distance-weighted average method was used to represent the average occupancy probability for each stream segment. To produce the distance-weighted average, the occupancy probability of each OM reach was multiplied by the proportion of the reach’s stream length to the total length of each stream segment that has some likelihood of being occupied by bull trout. The length of potential habitat available for bull trout are presented in Table 4.12-15.

Table 4.12-15 Length of Available Habitat for Potential Occupancy for Bull Trout Under the 2021 MMP

<table>
<thead>
<tr>
<th>Stream Reach</th>
<th>Baseline (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 112 (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR upstream from Meadow Creek</td>
<td>13.1</td>
<td>13.9</td>
<td>13.1</td>
<td>13.1</td>
<td>13.9</td>
<td>13.1</td>
</tr>
<tr>
<td>Meadow Creek and EFMC</td>
<td>13.1</td>
<td>7.1</td>
<td>6.8</td>
<td>7.4</td>
<td>15.2</td>
<td>14.0</td>
</tr>
<tr>
<td>East Fork SFSR between Meadow Creek and Yellow Pine pit</td>
<td>6.5</td>
<td>5.6</td>
<td>7.8</td>
<td>6.9</td>
<td>7.4</td>
<td>8.1</td>
</tr>
<tr>
<td>East Fork SFSR Between Yellow Pine pit and Sugar Creek</td>
<td>1.2</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>

The largest decreases of available potential habitat for bull trout and westslope cutthroat trout relative to baseline conditions would occur in the Meadow Creek drainage. During this period, the main activities that contribute to the loss of potential habitat in these areas are the diversion of Meadow Creek around the TSF footprint; the construction of the rock drain on EFMC and the East Fork SFSR tunnel; and
dewatering of the Yellow Pine pit lake, all occurring in Mine Year -1. The length of available habitat in these areas would increase at Mine Year 18 following restoration of Meadow Creek along the TSF, however, there is still potentially usable bull trout habitat with occupancy potential that does get factored into the modeled results.

Mine actions, stream enhancement, and restoration implemented by Mine Year 18 would remove all major fish passage blockages. Any remaining available habitat blockages would occur only in non-enhanced reaches and the Meadow Creek TSF high-gradient areas where fish cannot naturally access the available habitat. The approximately upper 10 km of Meadow Creek would remain blocked in perpetuity due to the high-gradient stream segments flowing off the TSF.

Overall, the SGP is expected to result in minor, permanent, and localized benefits to occupancy probability and the available habitat for occupancy potential for bull trout.

Critical Habitat

Critical Habitat for bull trout in the active mine area would be impacted by various activities including active mining, diversions, barrier removal, and stream restoration. An analysis of designated Critical Habitat currently blocked due to passage barriers indicates that the largest impacts to Critical Habitat for bull trout would come from barrier removal. Nearly 20 km of Critical Habitat are blocked for migratory bull trout above the Yellow Pine pit under baseline conditions but are occupied by non-migratory bull trout. This barrier would be removed before mine operations begin (Mine Year -1) to allow access for fluvial and adfluvial bull trout above these barriers. An existing barrier to bull trout in Meadow Creek upstream from East Fork Meadow Creek would be removed but would be replaced by a pipeline along the TSF during operations and then a gradient barrier post-closure. This barrier would block passage to the headwaters of Meadow Creek, but not eliminate suitable habitat for any bull trout currently present. Overall, the effects of the SGP on bull trout access to Critical Habitat within the mine area would be major, permanent, and localized.

Integration of Effects

The combination of physical stream channel changes, direct effects to individuals, and changes to many of the WCIs would affect bull trout in the mine area. Some SGP activities may improve access to habitat from baseline conditions. Despite some improvement to access, there remain some potential effects associated with the 2021 MMP that may cause injury or mortality to individuals and permanent displace bull trout from the analysis area.

Post-closure, a net decrease in quality and quantity of bull trout habitat would occur despite removal of passage barriers and an increase of lake habitat for bull trout including:

- Changes to water chemistry would primarily have minor effects but would have an unknown level of beneficial effects through the reduction of arsenic and antimony.

- The loss of the Yellow Pine pit lake would result in a net long-term impact to bull trout, but a permanent negligible net change once the Stibnite Lake is constructed by Mine Year 11. The construction of the fishway, and subsequent channel restoration of the East Fork SFSR, would
provide volitional access to habitat that was not previously accessible to the adfluvial population, which may provide additional spawning habitat. Additional enhancements to the East Fork SFSR and Meadow Creek would provide additional habitat benefits.

- There would be a net loss in bull trout thermally suitable habitat due to water temperatures exceeding the thermal requirements for spawning, incubation/emergence and rearing, primarily in Meadow Creek.

- Changes in flows would result in a net decrease in bull trout habitat in Meadow Creek and in the East Fork SFSR, but most flows would return to near baseline conditions, particularly in the East Fork SFSR after mine closure and post-closure.

- The removal of barriers would provide access to upstream habitat not previously volitionally accessed. This would result in a benefit to bull trout. A new barrier would be constructed in Meadow Creek along the TSF, which would result in blockage. Overall, there would be a net increase in accessibility to habitat for bull trout.

- There would be a minor net increase in occupancy potential for bull trout.

- There would be a net loss in Critical Habitat for bull trout in upper Meadow Creek because of the diversion around the TSF, and later by the completion of the TSF, which would become a gradient barrier to upstream and downstream fish passage.

**Westslope Cutthroat Trout**

Westslope cutthroat trout would be affected by the 2021 MMP through changes in water temperature and flow, which affects other factors such as habitat through WUA, occupancy probability, and Critical Habitat. The effects to westslope cutthroat trout are described below.

**Water Temperature**

The following is a summary of the analysis and potential impacts from water temperature changes in streams at the mine site from ESS 2019a. **Table 4.12-16** presents the length of streams that have positive westslope cutthroat trout occupancy probability that fall within the temperature threshold categories for westslope cutthroat trout life stages. Length of habitat for westslope cutthroat trout egg incubation/emergence and juvenile rearing are based the amount of habitat with suitable thermal conditions using the summer maximum temperatures. The other life stages are outside the summer – fall modeled parameters, and therefore are not included in the analysis.
Table 4.12-16 Length of Stream Habitat that Meets the Optimal Thermal Requirements for Westslope Cutthroat Trout Under the 2021 MMP

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Baseline (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 22 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 32 (km)</th>
<th>Mine Year 52 (km)</th>
<th>Mine Year 112 (km)</th>
<th>Change from Baseline to Mine Year 112 (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Yellow Pine pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubation/Emergence</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.35</td>
</tr>
<tr>
<td>Juvenile Rearing</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>2.01</td>
<td>1.48</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>1.66</td>
<td>-0.35</td>
</tr>
<tr>
<td>Above Yellow Pine pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubation/Emergence</td>
<td>0.85</td>
<td>0.78</td>
<td>0.78</td>
<td>0.37</td>
<td>0.37</td>
<td>0.37</td>
<td>2.11</td>
<td>2.11</td>
<td>2.11</td>
<td>+1.26</td>
</tr>
<tr>
<td>Juvenile Rearing</td>
<td>20.91</td>
<td>17.33</td>
<td>17.69</td>
<td>18.74</td>
<td>19.15</td>
<td>23.40</td>
<td>21.65</td>
<td>21.65</td>
<td>21.65</td>
<td>+0.74</td>
</tr>
<tr>
<td>Total Available Habitat</td>
<td>24.20</td>
<td>18.11</td>
<td>18.47</td>
<td>19.52</td>
<td>19.52</td>
<td>23.77</td>
<td>23.77</td>
<td>13.77</td>
<td>23.77</td>
<td>-0.73</td>
</tr>
</tbody>
</table>

As shown in Table 4.12-16, there are slight decreases in suitable habitat conditions for egg incubation/emergence during operations, but an increase for post-closure conditions. Relative to baseline conditions:

- There would be a decrease in thermally suitable condition for egg incubation/emergence due to higher water temperatures during operations and the early period of the post-closure, but after Mine Year 27, water temperatures begin to decrease, resulting in a net increase in thermally suitable conditions for egg incubation/emergence upstream from the Yellow Pine pit lake cascade barrier.

- There would be a decrease in thermally suitable rearing habitat during operations and early post-closure, but after Mine Year 22, water temperatures begin to decrease, resulting in a net increase in thermally suitable rearing habitat upstream from the Yellow Pine pit lake cascade barrier.

Based on modeled results, the effects of the SGP on westslope cutthroat trout caused by changes to thermally suitable habitat are expected to be minor, permanent, and localized.

Weighted Usable Area (PHABSIM)

Under the 2021 MMP, the largest impacts on low-flow discharge for the project site would be at Meadow Creek between Mine Year 2 and Mine Year 8. Over this time period, flows are predicted to decrease between 11 percent and 36 percent (Table 4.12-5; mean = 18 percent and median = 20 percent). Since Meadow Creek is a small stream, it is comparable to Summit Creek. For Summit Creek, the PHABSIM
results indicated an 87 percent reduction in discharge from 7.8 cfs to 1 cfs which would result in a 99 percent reduction in adult cutthroat trout habitat. Effects on the habitat for the cutthroat spawning life stage were about half as large. The predicted reduction in adult habitat at Summit Creek associated with a reduction in flow from 7.8 cfs to 4.4 cfs (44 percent) was predicted to equate to a 56 percent decline in adult cutthroat habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size. For Meadow Creek, the impacts on cutthroat trout habitat are major, permanent and localized.

For the East Fork SFSR above Sugar Creek site, which is represented by Sugar Creek, flows are predicted to decrease between Mine Year 1 and Mine Year 14 ranging from 7 percent to 25 percent (Table 4.12-5; mean = 16 percent and median = 16 percent). For Sugar Creek, the PHABSIM results indicated a 90 percent reduction in discharge from 9.9 cfs to 1.0 cfs which would result in a 99 percent reduction in adult cutthroat trout habitat. Juvenile cutthroat trout habitat loss results were slightly lower, while effects on cutthroat fry habitat were about half as large. The predicted reduction in adult habitat at Sugar Creek associated with a decrease in flow from 9.9 cfs to 5.4 cfs (46 percent) was predicted to equate to a 53 percent decline in adult cutthroat trout habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size. For the East Fork SFSR above Sugar Creek, the impacts on cutthroat trout habitat are major, long-term, and localized.

For the East Fork SFSR at Stibnite site, which is represented by East Fork SFSR Downstream from Sugar Creek, flows are predicted to decrease between Mine Year 2 and Mine Year 8 ranging from 6 percent to 20 percent (Table 4.12-5; mean = 10 percent, median = 11 percent). For East Fork SFSR Downstream from Sugar Creek, the PHABSIM results indicated a 60 percent reduction in discharge from 63 cfs to 25 cfs which would result in a 67 percent reduction in adult cutthroat trout habitat. No habitat data were available for juvenile cutthroat trout habitat, but the effects on cutthroat fry habitat were much lower with a 24 percent decrease. The predicted reduction in adult habitat at Sugar Creek associated with a decrease in flow from 63 cfs to 44 cfs (30 percent) was predicted to equate to a 32 percent decline in adult cutthroat trout habitat and only a 6 percent reduction in cutthroat fry habitat. There were no PHABSIM results provided for smaller decreases in discharge at low flows for this stream size or for the cutthroat trout juvenile life stage. For the East Fork SFSR at Stibnite site, the impacts on cutthroat trout habitat are moderate, long-term, and localized.

Analysis of relevant PHABSIM modeling from the region indicates the effects of 2021 MMP discharge impacts on physical habitat could be moderate to major, long term, and localized.

Occupancy Probability

Occupancy probability and stream length with occupancy probability was calculated in the same manner for westslope cutthroat trout as described for bull trout.

Stream channel alterations in the East Fork SFSR and Meadow Creek would impact occupancy probabilities for westslope cutthroat trout in the mine area. The largest increase in westslope cutthroat trout occupancy probability occurs in the East Fork SFSR between Sugar Creek and the Yellow Pine pit lake in Mine Year 6 but decrease in Mine Year 12 but increases again by Mine Year 112 (Table 4.12-17). The increase in Mine Year 6 in the East Fork SFSR is caused by a decrease in average water temperatures between mid-July and late September. Water temperatures have higher maximums, but also lower
minimums during this period. During this time period, less water from Meadow Creek is flowing into the East Fork SFSR, which affects the daily temperature moderation. As a result, the lower average temperature results in a higher occupancy probability for westslope cutthroat trout in the East Fork SFSR between the Yellow Pine pit lake and Sugar Creek. The East Fork SFSR upstream of the Yellow Pine pit lake and the Meadow Creek drainage all have increased occupancy probabilities for westslope cutthroat trout over time.

**Table 4.12-17 Distance Weighted Average Occupancy Probability (in Percent) of Westslope Cutthroat Trout under the 2021 MMP**

<table>
<thead>
<tr>
<th>Stream Reach</th>
<th>Baseline</th>
<th>Mine Year 6</th>
<th>Mine Year 12</th>
<th>Mine Year 18</th>
<th>Mine Year 27</th>
<th>Mine Year 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR upstream from Meadow Creek</td>
<td>64.3%</td>
<td>64.4%</td>
<td>64.8%</td>
<td>64.4%</td>
<td>64.4%</td>
<td>64.8%</td>
</tr>
<tr>
<td>Meadow Creek and EFMC</td>
<td>63.9%</td>
<td>64.6%</td>
<td>64.6%</td>
<td>65.1%</td>
<td>64.5%</td>
<td>66.3%</td>
</tr>
<tr>
<td>East Fork SFSR between Meadow Creek and Yellow Pine pit</td>
<td>64.2%</td>
<td>65.0%</td>
<td>66.5%</td>
<td>65.7%</td>
<td>65.6%</td>
<td>65.4%</td>
</tr>
<tr>
<td>East Fork SFSR between Yellow Pine pit and Sugar Creek</td>
<td>68.0%</td>
<td>70.2%</td>
<td>65.5%</td>
<td>65.7%</td>
<td>65.6%</td>
<td>67.7%</td>
</tr>
</tbody>
</table>

With the occupancy probability identified in each system, the length of habitat that has an occupancy probability in each stream was calculated. The length of potential habitat available for westslope cutthroat trout are presented in **Table 4.12-18**.

**Table 4.12-18 Length of Available Habitat for Potential Occupancy for Westslope Cutthroat Trout Under the 2021 MMP**

<table>
<thead>
<tr>
<th>Stream Reach</th>
<th>Baseline (km)</th>
<th>Mine Year 6 (km)</th>
<th>Mine Year 12 (km)</th>
<th>Mine Year 18 (km)</th>
<th>Mine Year 27 (km)</th>
<th>Mine Year 112 (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork SFSR upstream from Meadow Creek</td>
<td>13.1</td>
<td>13.9</td>
<td>13.1</td>
<td>13.1</td>
<td>13.9</td>
<td>13.1</td>
</tr>
<tr>
<td>Meadow Creek and EFMC</td>
<td>13.1</td>
<td>7.1</td>
<td>6.8</td>
<td>7.4</td>
<td>15.2</td>
<td>14.0</td>
</tr>
<tr>
<td>East Fork SFSR between Meadow Creek and Yellow Pine pit</td>
<td>6.7</td>
<td>5.6</td>
<td>7.8</td>
<td>6.9</td>
<td>7.4</td>
<td>8.1</td>
</tr>
<tr>
<td>East Fork SFSR between Yellow Pine pit and Sugar Creek</td>
<td>1.2</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>

The largest decreases of available potential habitat for westslope cutthroat trout relative to baseline conditions would occur in the Meadow Creek drainage. During this period, the main activities that contribute to the loss of potential habitat in these areas are the diversion of Meadow Creek around the TSF footprint; the construction of the rock drain on EFMC and the East Fork SFSR tunnel; and
Dewatering of the Yellow Pine pit lake, all occurring in Mine Year -1. The length of available habitat in these areas would increase at Mine Year 18 following restoration of Meadow Creek along the TSF.

Mine actions, stream enhancement, and restoration implemented by Mine Year 18 would remove all major fish passage blockages. Any remaining available habitat blockages would occur only in non-enhanced reaches and the Meadow Creek TSF high-gradient areas where fish cannot naturally access the available habitat. The approximately upper 10 km of Meadow Creek would remain blocked in perpetuity due to the high-gradient stream segments flowing off the TSF. Based on the current known extent westslope cutthroat trout occupancy, fish in the upper headwaters of Meadow Creek would remain isolated.

Overall, the SGP is expected to result in minor, permanent, and localized benefits to occupancy probability and the available habitat for occupancy potential for westslope cutthroat trout.

Integration of Effects

The combination of physical stream channel changes, direct effects to individuals, and changes to many of the WCIs would negatively affect westslope cutthroat trout in the analysis area through the loss of suitable habitat. Despite some improvement to access, there remain potential effects which may cause injury or mortality to individuals and/or displacement of westslope cutthroat trout.

Following reclamation, the net effect would be a minor loss of both quantity and quality of habitat for westslope cutthroat trout including:

- Changes to water chemistry would primarily have minor effects but would have an unknown level of beneficial effects through the reduction of arsenic and antimony.

- Habitat enhancements to the East Fork SFSR and Meadow Creek would provide benefits to westslope cutthroat trout habitat.

- The primarily net reduction in water temperatures in the East Fork SFSR and Meadow Creek would provide a net minor benefit for westslope cutthroat trout. There is a slight modeled decrease in temperature-suitable habitat for all life stages.

- Changes in flows would result in a net decrease in westslope cutthroat trout habitat in Meadow Creek, but most flows would return to near baseline conditions in the East Fork SFSR after mine closure and post-closure. Habitat quantified by WUA available to westslope cutthroat trout based on PHABSIM model results show low reductions in WUA post-closure, with a negligible net decrease in westslope cutthroat trout habitat.

- The removal of barriers would have negligible effects on westslope cutthroat trout. A new barrier would be constructed in Meadow Creek along the TSF, which would result in blockage, which may result in isolation of fish in the headwaters.

- There would be a minor net increase in occupancy potential for westslope cutthroat trout.
The 2021 MMP may indirectly impact westslope cutthroat trout individuals but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area.

4.12.2.3 Johnson Creek Route Alternative

Only impacts from the Johnson Creek Route Alternative that differ from the 2021 MMP are discussed below.

Direct Impacts to Individuals

Spill Risk

The potential for surface water quality impacts from accidental fuel or chemical spills along the mine access roads would be comparable between the action alternatives. However, all vehicle trips would traverse the Johnson Creek Route under this alternative, resulting in greater use of the Johnson Creek Route access roads. The potential location and extent of accidental spills would therefore differ compared to the 2021 MMP. The Johnson Creek Route is located in close proximity to streams (i.e., within 100 feet) for 6.5 miles, so the potential for fuel and hazardous chemical spills impacting surface water quality is higher than for travel on the Burntlog Route which is within 100 feet of a stream for 1.69 miles. Overall design features proposed by Perpetua, design features required by the Forest Service, and permit stipulations and regulatory requirements from state and federal agencies (including use of USDOT-certified containers and registered transporters) would reduce the risk of spills and promote effective response should a spill occur. The effects of spills associated with the Johnson Creek Route alternative on surface water and potentially on fish and aquatic habitat would be minor to major, temporary, and localized depending on the spill location.

Impacts to Watershed Condition Indicators

Sediment and Turbidity

The number of streams crossed along the Johnson Creek Route (43) would be reduced compared to the 2021 MMP. However, the Johnson Creek Route would be widened and upgraded under this alternative. Therefore, surface water quality impacts from erosion and sedimentation during access road construction could increase during the construction activities and would require implementation of sediment and erosion BMPs.

Use of the Johnson Creek Route for site access would avoid construction-related impacts from sedimentation at 21 different streams compared to the 2021 MMP. These streams include Burntlog Creek, East Fork Burntlog Creek, the East Fork SFSR, Johnson Creek, Landmark Creek, Peanut Creek, Rabbit Creek, Riordan Creek, Trapper Creek, and 12 unnamed waterbodies.

During mine construction, the number of daily vehicle trips to the SGP would be comparable between the alternatives. The number of daily vehicle trips also would be the same during mine operations and reclamation; however, all vehicle trips would traverse the Johnson Creek Route under this alternative, resulting in greater use of the Johnson Creek Route access roads, and more fugitive dust generation and greater wear and tear on the road surface. In addition, use of the Johnson Creek Route would require two additional years of construction. The resulting surface water quality impacts from erosion and
sedimentation would therefore differ in location and extent compared to the 2021 MMP but would be similar in magnitude.

Prevention of impacts would be achieved through proper road design, construction, grade control, fugitive dust control and, in the winter months, snow removal and “sanding” using gravel and coarse sand with minimal fines to avert slippery conditions and reduce off-site sedimentation during the spring runoff season (Section 2.4.9).

Overall, based on identified maintenance activities, design features (Section 2.4.9), and permit stipulations from state and federal agencies, traffic-related dust and erosion/sedimentation would be within the normal range of properly maintained NFS roads. The duration for traffic-related dust and erosion/sedimentation would last throughout the entire period of use of the Johnson Creek Route (approximately 40 years); however, the potential for these effects would be incrementally reduced during closure and reclamation. Due to the nature of airborne dust and sediment transport by streams, the geographic extent of the impact could be hundreds of feet to miles, depending on many site- and event-specific factors, but it is expected that effects would be limited to within the subwatersheds of the analysis area.

The effects of the Johnson Creek Route Alternative of sedimentation would be moderate, long-term, and localized.

Chemical Contaminants

The water quality effects of the Johnson Creek Route Alternative are the same as and the 2021 MMP with regard to contact water, water treatment, groundwater chemistry, surface water chemistry, stream temperature, and impaired water bodies. The change in site access does result in some differences in effects of sedimentation and fuels and hazardous chemicals as noted above.

4.12.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. A mitigation measure addressing effects of stream water temperature on fish is described in Section 4.9.3.

4.12.4 Irreversible and Irretrievable Commitments of Public Resources

4.12.4.1 No Action Alternative

Under the No Action Alternative there would be no irreversible or irretrievable commitment of fish and aquatic habitat resources.

4.12.4.2 Action Alternatives

Irreversible Commitments – A commitment of resources is irreversible when the impacts of the proposed action or alternatives would limit the future options for use of the resource. This applies
primarily to non-renewable resources or to processes or resources that are renewable over long periods of time.

The direct mortality of fish would be an irreversible impact that could occur under the Action Alternatives. Although fish exclusion barriers and trap and transfer activities would be incorporated to minimize fish mortality, incidental injury or mortality is expected to occur. These “takes” of fish in the mine site would be considered irreversible. Species subject to potential irreversible losses include Chinook salmon, steelhead trout, bull trout, and cutthroat trout.

**Irretrievable Commitments** – A commitment of resources is irretrievable when the impacts of the action alternatives would result in a loss of production, harvest, or use of renewable resources. An irretrievable commitment of resources occurs when a resource that is renewable over a relatively short period of time is consumed during the life of the SGP and is therefore unavailable for other uses until the use ceases and it is renewed and once again available. It is the temporal loss of resources that is considered irretrievable.

This includes resources that are renewable over a short time, such as riparian vegetation and streams. While the loss of the resource itself is reversible (through mitigation), the temporal loss of the use of the resource or habitat is irretrievable. The SGP would cause a temporal loss of aquatic habitat for fish species inhabiting certain stream reaches.

Portions of Meadow Creek upstream of the southern extent of the TSF would be irretrievable and unavailable to downstream fish within Meadow Creek during construction, operations, and post-closure. The presence of the TSF and TSF Buttress would essentially isolate any populations of bull trout and westslope cutthroat trout which are known to inhabit the upper reaches of Meadow Creek. After closure and reclamation, restoration of Meadow Creek over the TSF/TSF Buttress would restore habitat, but a fish barrier would remain in place and keep the upstream populations isolated.

The loss of existing aquatic habitat in the Yellow Pine pit lake may constitute as an irretrievable commitment of resources.

**4.12.5 Short-term Uses versus Long-term Productivity**

**4.12.5.1 No Action Alternative**

Under the No Action Alternative, there would be no open pit mining or removal of legacy waste material at the SGP. Consequently, no short-term use would occur that would affect fisheries resources, and no change in long-term productivity would occur.

**4.12.5.2 Action Alternatives**

Mining is a short-term land use with its effects on long-term productivity dependent on the success of its closure and reclamation activities. Construction and operation of the proposed mine would result in short-term impacts to fish and associated habitat. During construction and operations, some sections of aquatic habitat would be removed from the footprint of the proposed mine site. Changes to aquatic habitat include diverting the East Fork SFSR around Yellow Pine pit and subsequently backfilling and constructing a stream channel atop the pit at closure. In the long-term restoring fish passage upstream of the Yellow Pine pit would result in an increase in available habitat for anadromous and resident fish in the analysis area.
Short-term changes to aquatic habitat in Meadow Creek include diverting a portion of the creek just south of the proposed Hangar Flats open pit, and the loss of habitat where the TSF and TSF Buttress would be located. The short-term loss of habitat would negatively affect fish populations in Meadow Creek over the life of the mine. Closure and reclamation would restore habitat over time.

4.13 **Wildlife and Wildlife Habitat**

4.13.1 **Impact Definitions and Effects Analysis Indicators and Methodology**

Although wildlife and wildlife habitat were not identified as a significant issue, it was identified by the public, the Forest Service, and cooperating agencies as a relevant consideration. The analysis of effects on wildlife and wildlife habitat includes the following issues and indicators:

**Issue**: The SGP may cause changes in wildlife habitat in the analysis area that may affect wildlife species including special-status species (threatened, endangered, proposed, MIS, and sensitive).

**Indicators**:

- Acres of general wildlife habitat disturbed.
- Acres of special-status wildlife habitat disturbed.
- Acres of disturbance to other high-value habitats such as crucial and or high-value big game ranges, wetlands, and seep and spring areas.
- Change in noise levels (in decibels) in, or in proximity to, wildlife habitat.
- Miles of new roads proposed for the SGP.
- Acres of disturbance for new and upgraded transmission lines.

**Issue**: The SGP may affect wildlife by introducing barriers to movement, including the mine site, infrastructure, new/existing maintained roads, new transmission line.

**Indicators**:

- Length of potential movement barriers.

**Issue**: The SGP may affect wildlife by potentially increasing the risk of direct injury or mortality.

**Indicators**:

- Amount of increased traffic along the access routes, or acres of ground disturbance for less-mobile species.
- Miles of new roads and transmission lines.
- Miles of existing roads that are not currently plowed that would be plowed.
The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Existing habitat conditions for focal wildlife species were developed using habitat models originally designed for the 2003 Payette Forest Plan revision. These wildlife habitat models were recently updated for the PNF using the best available science, including information from models developed for the BNF Wildlife Conservation Strategy (WCS) (Nutt et al. 2010), recent scientific literature, and PNF and BNF wildlife research data and survey reports. A summary of modeling parameters for existing source habitat for each species analyzed is documented in Appendix A of the SGP Project Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j).

4.13.2 Direct and Indirect Effects

4.13.2.1 No Action Alternative

**Threatened, Endangered, Proposed, and Candidate Species**

**Canada Lynx**

There have been no recent observations of Canada lynx in the Operations Area Boundary, existing Utilities Area, and off-site facilities; although, if there are transient Canada lynx in the region, they could potentially use these areas as they have in the past. Because some of the existing roadways in the Canada lynx analysis area bisect potential linkage areas, they also would likely continue to affect transient Canada lynx through habitat fragmentation and potential vehicle-wildlife collisions.

**Northern Idaho Ground Squirrel**

While modeled habitat for the NIDGS occurs in the region, no NIDGS are known or estimated to occur in the Operations Area Boundary, thus no current impacts are occurring or would occur under the No Action Alternative in this area. Habitat fragmentation and vehicle-wildlife collisions would still be present for NIDGS, if they occur in suitable habitats in the future, due to existing roadways under the No Action Alternative. As depicted by modeled habitat, there is a possibility that NIDGS may occur in existing utility corridors. Because the existing off-site facilities occupy a small area and there would be no new facilities built, there would be no effects on NIDGS from off-site facilities under the No Action Alternative.

**Wolverine**

Wolverines would likely continue to use the Operations Area Boundary much as they currently do. Existing roads also would continue to affect wolverines through habitat fragmentation and vehicle-wildlife collisions. There would be no new loss of habitat or source of noise and light for wolverines due to utility construction. Depending on the future use of current off-site facilities, wolverines would likely continue to avoid them as they currently do.

**Monarch Butterfly**

Monarch butterflies would likely continue to use the Operations Area Boundary as they currently do. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions.
collisions and noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Focal Species, Including Region 4 Sensitive Species**

**Habitat Family 1 – Low Elevation, Old Forest**

*White-Headed Woodpecker*

There is no modeled habitat near the Operations Area Boundary for white-headed woodpeckers, and they are not expected to occur. Existing roads in close proximity to modeled habitat would continue to affect white-headed woodpeckers through habitat fragmentation and noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat, source of noise and light, or increased risk of collision for woodpeckers. There would be no loss of habitat or new sources of noise and light due to off-site facilities.

*Lewis’s Woodpecker*

Effects to the Lewis’s woodpecker would be the same as described for the white-headed woodpecker under the No Action Alternative.

**Habitat Family 2 – Broad Elevation, Old Forest**

*American Three-toed Woodpecker*

Effects to the American three-toed woodpecker would be the same as described for the white-headed woodpecker under the No Action Alternative.

*Black-Backed Woodpecker*

Effects to the black-backed woodpecker would be the same as described for the white-headed woodpecker under the No Action Alternative.

*Dusky Grouse (Summer)*

Modeled habitat is limited for dusky grouse in the Operations Area Boundary, and they are assumed to occur sporadically. Individuals would likely continue to use the Operations Area Boundary as they currently do. Existing roads would continue to affect dusky grouse through habitat fragmentation, direct mortality through vehicle strikes, and noise, light, or fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no loss of habitat, sources of noise and light impacts, or increased risk of collision for dusky grouse. There would be no loss of habitat or sources of noise and light impacts due to off-site facilities.
**Boreal Owl**

Overall, boreal owls would likely continue to use the Operations Area Boundary as they currently do. Existing roads would continue to affect wildlife through habitat fragmentation and the risk of vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there would be no loss of habitat, sources of noise and light, or increased risk of collision for boreal owls. There would be no loss of habitat or sources of noise and light impacts due to off-site facilities.

**Fisher**

Fishers may use the Operations Area Boundary as they have in limited areas in the past. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Flammulated Owl**

See the boreal owl analysis for effects under the No Action Alternative that also would apply to the flammulated owl.

**Great Gray Owl**

See the boreal owl analysis for effects under the No Action Alternative that also would apply to the great gray owl.

**Northern Goshawk**

Overall, northern goshawks would likely continue to use the Operations Area Boundary as they currently do. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat, source of noise and light impacts, or increased risk of collision for northern goshawks. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Pileated Woodpecker**

Pileated woodpeckers would likely continue to use the Operations Area Boundary as they currently do, which is believed to be rarely. Existing roads would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions and noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat, source of noise and light impacts, or increased risk of collision for woodpeckers. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.
**Silver-haired Bat**

Because there is suitable habitat nearby for silver-haired bat and they are assumed to occur in the Operations Area Boundary (especially the northern portion), individuals would likely continue to use the Operations Area Boundary as they currently do. Existing roads would continue to affect silver-haired bats through habitat fragmentation and disturbance from noise, light, and fugitive dust impacts due to traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat, source of noise and light impacts, or increased risk of collision for bats. Individual bats would likely continue to use existing utility corridors for foraging. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Habitat Family 3 – Forest Mosaic**

**Mountain Quail**

Because there is potentially suitable habitat for mountain quail, any individuals would likely continue to use the Operations Area Boundary as they currently do in limited areas. Existing roads would continue to affect wildlife through habitat fragmentation, vehicle-wildlife collisions, and noise, light, and fugitive dust impacts. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Habitat Family 5 – Forest and Range Mosaic**

**Gray Wolf**

Gray wolves would likely continue to use the Operations Area Boundary as they currently do. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Peregrine Falcon**

Peregrine falcons would likely continue to use the Operations Area Boundary as they currently do. Existing roads, especially Johnson Creek Road, would continue to affect falcons through habitat fragmentation and disturbance due to noise and light impacts. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Rocky Mountain Bighorn Sheep**

Rocky Mountain bighorn sheep may use the Operations Area Boundary as they have in limited areas in the past. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there
would be no new loss of habitat or source of noise and light impacts. There would be no new loss of
habitat or source of noise and light impacts due to off-site facilities.

Habitat Family 7 – Forests, Woodland, and Sagebrush

Townsend’s Big-eared Bat

Townsend’s big-eared bats have not been observed, but are assumed to occur in the Operations Area
Boundary, and individuals would likely use the Operations Area Boundary much as they currently do.
Existing roads also would continue to affect wildlife through habitat fragmentation and noise, light, and
fugitive dust impacts. No new transmission lines or communication towers would be constructed, so there
would be no new loss of habitat, source of noise and light impacts, or increased risk of collision for the
Townsend’s big-eared bat. There would be no new loss of habitat or source of noise and light impacts due
to off-site facilities.

Habitat Family 13 – Riverine Riparian and Wetland

Bald Eagle

Because there is potentially suitable habitat for bald eagles and they are assumed to occur in the
Operations Area Boundary, individuals would likely continue to use the Operations Area Boundary as
they currently do in limited areas. Existing roads also would continue to affect wildlife through habitat
fragmentation, particularly along Johnson Creek Road and near Warm Lake where there are known nest
sites. No new transmission lines or communication towers would be constructed, so there would be no
new loss of habitat, source of noise and light impacts, or increased risk of collision for bald eagles. There
would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

Columbia Spotted Frog

Columbia spotted frogs would likely continue to use the Operations Area Boundary as they currently do.
Existing roads also would continue to affect frogs through habitat fragmentation, direct mortality risks
due to vehicle-wildlife collisions, and noise, light, and fugitive dust impacts from vehicles. No new
transmission lines or communication towers would be constructed, so there would be no new loss of
riparian habitat. There would be no new loss of habitat or source of noise and light impacts due to off-site
facilities.

Idaho Species of Greatest Conservation Concern

SGCN would likely continue to use the Operations Area Boundary as they currently do. Existing roads
also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions and
noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers
would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There
would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

General Wildlife Species

General wildlife species would likely continue to use the Operations Area Boundary as they currently do.
Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife
collisions and noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Big Game Species**

Big game species would likely continue to use the Operations Area Boundary they currently do. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**Migratory Bird Species and Bald and Golden Eagles**

Migratory bird species and bald and golden eagles would likely continue to use the Operations Area Boundary as they currently do. Existing roads also would continue to affect wildlife through habitat fragmentation and vehicle-wildlife collisions and noise, light, and fugitive dust impacts from traffic. No new transmission lines or communication towers would be constructed, so there would be no new loss of habitat or source of noise and light impacts. There would be no new loss of habitat or source of noise and light impacts due to off-site facilities.

**4.13.2.2 2021 MMP**

**Threatened, Endangered, Proposed, and Candidate Species**

The analysis of direct effects includes the potential take of ESA listed species. Pursuant to the ESA, take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” (16 USC 35.1531 et seq.). Take of an individual or population could occur for various reasons such as traffic collisions, change in an individual or population’s habitat use due to noise, other disturbance, or contamination of food or water sources. Direct effects also would include loss of habitat or the encroachments into wildlife migration or travel areas, although no defined corridors have been identified. For all species, habitat loss could be temporary (0 to 3 years); short-term (3 to 15 years); long-term (>15 years); or permanent for land use changes (i.e., pit lakes, TSF, TSF Buttress, transmission line upgrades). The analysis of potential indirect effects on threatened, endangered, proposed, and candidate species includes fragmentation of habitat; increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals; or other effects, such as increased human presence in the species-specific analysis areas (e.g., hunters, trappers, and recreationists) that can cause mortality (i.e., illegal hunting or trapping) or reduced breeding and recruitment in the future population.

**Canada Lynx**

The 2021 MMP compared to modeled habitat within each LAU is shown on **Figure 3.13-2**. Direct and indirect effects to Canada lynx are analyzed within a 5-mile buffer within the LAUs, to assess all potential impacts, including noise disturbance. This buffer distance was developed using best professional judgment, in coordination with the USFWS, to address potential indirect impacts from anthropogenic
influences and to account for potential impacts to transient Canada lynx potentially moving through the general SGP area. However, based on noise information presented in Section 4.6, most indirect impacts would occur within 1 to 2 miles from SGP components.

The percentage of unsuitable habitat in the LAUs is higher than the 30 percent threshold. In several LAUs that are currently not meeting the Forest Plan Standard TEST15 for suitable habitat (Stibnite, Yellowpine, Burntlog, Warm Lake, and Landmark; Table 4.13-1), there would be an additional loss of suitable habitat, and these LAUs would continue to not meet the Standard. For the LAUs currently meeting the Standard (East Mountain and West Mountain), the direct impacts from the SGP would not cause the Standard to be exceeded.

Table 4.13-1 shows the acres of suitable habitat that would be directly impacted in each LAU. Direct impacts to Canada lynx habitat across all LAUs would be 194 acres under the 2021 MMP. Using a 5-mile buffer on the SGP components within each LAU, the area of indirect impacts on Canada lynx habitat could total approximately 70,745 acres under the 2021 MMP.

### Table 4.13-1 Direct and Indirect Impacts on Canada Lynx Habitat

<table>
<thead>
<tr>
<th>LAU</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
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<tbody>
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<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Stibnite</td>
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<td>Yellowpine</td>
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<tr>
<td>Burntlog</td>
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<td>15,507</td>
</tr>
<tr>
<td>Warm Lake</td>
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<td>1,652</td>
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<tr>
<td>Landmark</td>
<td>3</td>
<td>5,736</td>
</tr>
<tr>
<td>East Mountain</td>
<td>9</td>
<td>15,969</td>
</tr>
<tr>
<td>West Mountain</td>
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</tr>
<tr>
<td>Total</td>
<td>194</td>
<td>70,745</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stibnite</td>
<td>80</td>
</tr>
<tr>
<td>Yellowpine</td>
<td>9</td>
</tr>
<tr>
<td>Burntlog</td>
<td>69</td>
</tr>
<tr>
<td>Warm Lake</td>
<td>2</td>
</tr>
<tr>
<td>Landmark</td>
<td>6</td>
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<td>East Mountain</td>
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<tr>
<td>West Mountain</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>175</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.

The Forest Service has preliminarily determined that the mine site, access roads, and utilities would affect, but not adversely affect, Canada lynx utilizing the area or their habitat. The off-site facilities would likely not affect transient Canada lynx under the 2021 MMP. Informal Section 7 ESA consultation is
ongoing with the USFWS. Therefore, based on the impact analysis for the Canada lynx and its habitat, the 2021 MMP would result primarily in localized, long-term, and permanent, minor impacts to the Canada lynx.

Mine Site

Although there is potentially suitable habitat for Canada lynx in the Canada lynx analysis area, there is no designated Critical Habitat on the PNF or BNF. The Operations Area Boundary and associated infrastructure may displace transient Canada lynx around the perimeter of these disturbances. This would be a large area, because the mine site area would measure approximately 6 miles long by 1 mile wide. Ruediger et al. (2000) found that Canada lynx often avoid large developments (e.g., ski resorts, facilities, etc.); therefore, it is likely that the Operations Area Boundary area would be a barrier to lynx movement, which would be a direct effect.

Direct mortality on lynx (e.g., vehicle collisions, destruction of dens, etc.) is not likely because lynx have not been documented in the Canada lynx analysis area; the analysis area does not contain prime denning habitat; and their movements are often nocturnal (Forest Service 2008d) when limited vehicle traffic would occur. Although some denning habitat may exist, the PNF and BNF are considered secondary lynx habitat (Interagency Lynx Biology Team 2013). The lack of denning habitats, on-going activity in the vicinity of the mine site, and absence of known resident individuals, make it unlikely that Canada lynx would be displaced by the 2021 MMP.

Indirect disturbance impacts to Canada lynx due to an increase in noise and light (e.g., blasting, vehicle traffic, operations, etc.) would be long-term. Construction, operation, and closure and reclamation activities at the mine site are likely to disturb any transient Canada lynx in the vicinity. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Additionally, light and noise impacts are reduced by vegetation, topography, and distance from the impact sources. The noise and light reduction strategies employed in the SGP area are expected to reduce impacts on transient Canada lynx by minimizing the intensity and duration.

Access Roads

Direct mortality on lynx (e.g., vehicle collisions) is not likely because lynx have not been documented in the Canada lynx analysis area and their movements are often nocturnal (Forest Service 2008d) when limited vehicle traffic would occur. However, the 2021 MMP would include construction of 15 miles of new road between the existing Burnt Log Road (FR 447) to the Thunder Mountain Road (FR 50375) at the mine site, and several smaller segments of realignment and upgrades. Construction and the year-round operation (and plowing in winter), of the Burntlog Route could be a potential source of mortality for transient Canada lynx. During construction (when traffic levels would be highest), the AADT level would be 65. The slow speed limits on the Burntlog Route would likely limit potential mortality or injury for individual Canada lynx by giving drivers more time to react to wildlife occurrences.

Roadways under the 2021 MMP may displace or alter the movement of transient Canada lynx. Linkage areas for Canada lynx have been estimated to occur north to south across Warm Lake Road (CR 10-579) and east to west across the South Fork of the Salmon River (Claar et al. 2004). Construction and use of the new 15-mile-long portion of the Burntlog Route would fragment habitat and could act as a barrier to
movement (Interagency Lynx Biology Team 2013). Increased traffic on Warm Lake Road (CR 10-579), Johnson Creek Road (CR 10-413), and Stibnite Road portion of the McCall-Stibnite Road (CR 50-412) also would discourage lynx from crossing these roads. Ruediger et al. (2000) found that Canada lynx often avoid roadways more as they scale from gravel roads to highways; therefore, it is possible that the access roads could act as a barrier to transient lynx movement, which would be a direct effect.

Additionally, the existing 11-mile groomed OSV trail from Warm Lake to Landmark would be closed under the 2021 MMP, and an approximately 10.4-mile groomed trail would utilize the existing Cabin Creek Road (FR 467). Depending on the area of modeled habitat crossed, this would result in a net gain of 0.6 mile of groomed OSV trail. However, there would also be a 2-acre parking area west of FR 467, and a new 1.5-mile groomed access trail from the Forest Service Warm Lake Project Camp on Paradise Valley Road (FR 488). This trail would cross modeled habitat for Canada lynx, which would cause additional indirect impacts during the winter due to noise from OSVs. During construction, the current OSV trail associated with Johnson Creek Road would be moved to the side of the road, but there would be no expected changes as it is an existing route.

Disturbance impacts to Canada lynx along roadways due to noise and light would be long-term. The noise and light reduction strategies employed along access roads during the SGP may be sufficient to reduce impacts on transient Canada lynx.

Indirect impacts could occur in the form of increased competition for resources, including the competition created by plowing the Burntlog Route, which is currently not plowed for winter use. Currently, access in this area during the winter is limited to predators suited for over-snow travel (i.e., lynx and wolverine). Construction and operation of the Burntlog Route would open new corridors for predators and recreational activities. This could increase the predation on snowshoe hares by other predators (e.g., coyotes) or become a source of mortality for prey species (e.g., snowshoe hare, squirrels, etc.), which could affect food availability for transient Canada lynx. The increased human access and potential increase in hunting and trapping pressure for lynx and prey species in previously undisturbed areas also would be indirect effects.

Upon closure, the new segments of the Burntlog Route would be decommissioned, recontoured, and reclaimed, which would remove impacts associated with traffic or human access in the long-term.

Utilities

Direct impacts on Canada lynx due to construction and operation of the utility corridors, substations, and communication towers are not likely because lynx have not been documented in the Canada lynx analysis area and the construction activities would be temporary. However, transient Canada lynx may occur sporadically. There would be new utility access roads, as well as new transmission lines and upgraded transmission lines. Habitats along utility corridors would be maintained in low structure (e.g., low vegetation) condition, which would widen the ROW effect for Canada lynx (Interagency Lynx Biology Team 2013). The new transmission line between the mine site and Johnson Creek substation would not intersect any modeled habitat. Upon closure, this new segment would be decommissioned and reclaimed. Decommissioning of the transmission line under the 2021 MMP would remove any potential effects in the long term.
Potential disturbance impacts due to noise and light near the substations would be long-term and likely of low impact. However, the impacts from constructing the utility corridors, substations, and communication towers would be temporary but of higher intensity. The noise and light reduction strategies employed along utility corridors and near communication towers would reduce impacts on transient Canada lynx during construction (Section 2.4.9).

**Off-site Facilities**

Direct impacts on Canada lynx from construction of the off-site facilities are unlikely because lynx have not been documented in the Canada lynx analysis area. However, the off-site facilities would impact approximately 4 acres of habitat in the Canada lynx analysis area. Transient Canada lynx individuals would likely avoid the off-site facility locations, but traffic associated with the off-site facilities may increase the potential for vehicle-wildlife collisions. The slow speed limits imposed would likely limit potential mortality or injury for individual Canada lynx.

Disturbance impacts to Canada lynx at the off-site facility locations due to noise and light would mostly occur during construction, but some effects would persist long-term. The noise and light reduction strategies employed at the off-site facilities would likely be sufficient to reduce impacts on transient Canada lynx.

**Northern Idaho Ground Squirrel**

Figure 3.13-3 shows the components of the 2021 MMP within the NIDGS analysis area compared to modeled habitat. Direct and indirect effects to NIDGS are analyzed within a 1-mile buffer of alternative components. This buffer distance was developed using best professional judgment, in coordination with the USFWS, to encompass the area of potential indirect impacts from anthropogenic influences (e.g., noise, light, human presence) at the mine site and along access roads. Direct impacts to NIDGS modeled habitat across the wildlife analysis area would be approximately 63 acres for the 2021 MMP. Using a 1-mile buffer on SGP components, the indirect area of impacts on modeled NIDGS suitable habitat is approximately 5,248 acres.

The Forest Service has preliminarily determined that the access roads and utilities would affect, a small amount of NIDGS suitable habitat and direct and indirect impacts would be the same. The mine site and off-site facilities would not affect NIDGS habitat. Overall impacts from the SGP would affect, but not adversely affect, NIDGS. Informal Section 7 ESA consultation is ongoing with the USFWS. Therefore, based on the impact analysis for the NIDGS and its habitat, the 2021 MMP would result primarily in localized, temporary, and short-term, minor impacts to the NIDGS.

**Mine Site**

There are no known observations of NIDGS or modeled habitat in the mine site area. Therefore, mine site activities under all alternatives would not affect NIDGS.

**Access Roads**

Road maintenance and vehicle traffic could directly impact individual NIDGS, if sites become occupied in the future, where the 2021 MMP components cross modeled habitat. The Burntlog Route would not
cross modeled suitable habitat, and construction would therefore not impact NIDGS habitat. However, Warm Lake Road (CR 10-579) does cross modeled habitat, and the increased traffic could pose a direct risk of mortality due to collisions, particularly during the warmer months when the species is active. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) and the new 7-mile temporary groomed OSV trail along Johnson Creek Road would occur in and near close proximity to modeled habitat for NIDGS but would be unlikely to affect NIDGS due to its seasons (i.e., late fall and winter) of use.

The existing (23 miles of NFS roads and 75 miles of county roads) and new roads (43 miles of Burntlog Route and utility access roads) may act as a barrier to squirrel movement and dispersal, which would be an indirect effect. Increased habitat fragmentation between colonies could indirectly impact dispersal between populations, which could lead to genetic and demographic consequences. However, Yensen and Tarifa (2019, 2018) observed no evidence of NIDGS or their sign at the proposed logistics facility, Trout Creek, or at various private land parcels along the project but there is a possibility that NIDGS may occur in the future at suitable sites. Site buffers and monitoring would be used to avoid or mitigate direct impacts on squirrel populations. If sites are determined to be occupied in the future, mitigation measures, such as seasonal restrictions, site buffers, and monitoring would be used to avoid or mitigate direct impacts on squirrel populations.

**Utilities**

Construction of the utility corridors, substations, and communication towers, as well as maintenance activities in the ROWs, would likely impact individual NIDGS where the 2021 MMP components overlap modeled habitat known to support populations. However, Yensen and Tarifa (2019, 2018) observed no evidence of NIDGS, or their sign associated with the utility components (e.g., within modeled habitat near the upgraded transmission line and Scott Valley Substation); but there is a possibility that NIDGS may occur in the future at suitable sites. Site buffers and monitoring would be used to avoid or mitigate direct impacts on squirrel populations. Reclamation during closure would reclaim the new transmission line segment, but this area does not overlap modeled habitat and would not likely provide additional modeled habitat.

**Off-site Facilities**

Construction of new off-site facilities is unlikely to impact individual NIDGS, because the 2021 MMP components do not overlap modeled habitat known to support populations. Yensen and Tarifa (2019, 2018) observed no evidence of NIDGS or their sign at the logistics facility; however, there is a possibility that NIDGS may occur in the future at suitable sites. Site checks and formal surveys would be conducted, as needed, prior to ground-disturbing activities in suitable habitat.

Vehicle traffic associated with the proposed off-site facilities could impact individual NIDGS where the 2021 MMP components cross modeled habitat known to support populations. Surveys of modeled habitat would be required before construction activities occur. All staff and contractors would be trained to reduce wildlife collisions.
Wolverine

Figure 3.13-4 shows the components of the 2021 MMP within the wolverine analysis area compared to modeled habitat. Direct and indirect effects to wolverine are analyzed within a 5-mile buffer of the 2021 MMP components, to assess all potential impacts, including noise disturbance. This buffer distance was developed using best professional judgment, in coordination with the USFWS, to address potential indirect impacts from anthropogenic influences and to account for potential impacts to wolverines moving through the general SGP area.

Persistent snow cover is used to assess impacts to wolverine habitat, particularly denning habitat. Table 4.13-2 summarizes the areas (in acres) with persistent snow cover in numbers of years (from 1 through 7) impacted by the 2021 MMP. This model depicts the number of years, out of seven, in which snow cover was present in the spring in selected pixels (April 24 – May 15). This time frame generally corresponds to the period of wolverine den abandonment. Most dens were located in areas that were snow covered for 5 to 7 years out of the total 7 years studied, indicating that wolverines select den sites in areas with the highest consistent snow coverage. Thus, the direct impacts on these areas would be a direct effect to wolverines and denning activities.

To be conservative, areas with persistent snow cover for years 5 through 7 indicate higher quality habitat (particularly denning habitat) than years 1 through 4. Indirect impacts were calculated by including all modeled habitat (years 1 through 7) within 5 miles of 2021 MMP components.

Table 4.13-2 Direct and Indirect Impacts on Wolverine Habitat

<table>
<thead>
<tr>
<th>Persistent Spring Snow Cover Years</th>
<th>Directly Impacted Habitat (acres)</th>
<th>Indirectly Impacted Habitat (acres)</th>
</tr>
</thead>
<tbody>
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<td>2021 MMP</td>
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<td></td>
</tr>
<tr>
<td>1-4</td>
<td>2,149</td>
<td>245,018</td>
</tr>
<tr>
<td>5-7</td>
<td>193</td>
<td>97,922</td>
</tr>
<tr>
<td>Johnson Creek Route Alternative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>1,915</td>
<td>228,945</td>
</tr>
<tr>
<td>5-7</td>
<td>90</td>
<td>74,171</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e

Wolverines have been well documented in the wolverine analysis area and several individual wolverines have been captured in and adjacent to the wolverine analysis area (Forest Service 2012a, 2015c; Heinemeyer et al. 2017). The Forest Service has preliminarily determined that the 2021 MMP may directly and indirectly impact wolverine individuals and habitat resulting in adverse impacts but would not jeopardize the continued existence of the species. Informal Section 7 ESA consultation is ongoing with the USFWS. The 2021 MMP would impact the most habitat overall, reduce habitat connectivity, and result in the highest level of displacement (particularly from breeding and winter range), based on direct and indirect impacts. Therefore, based on the impact analysis for the wolverine and its habitat, the 2021 MMP would result in localized and long-term impacts to the wolverine, particularly the local population (part of larger Central Idaho sub-populations).
Mine Site

Direct impacts on wolverines are likely in the mine site area due to habitat loss (approximately 810 acres) and associated habitat fragmentation; year-round vehicle traffic causing disturbance and potential avoidance behavior; and risk of vehicle collisions causing injury or mortality. However, the mine site also contains open water areas and disturbed ground, which would not provide habitat for wolverines. The mine site would measure approximately 6 miles long by 1 mile wide during operations and consist of approximately 881 acres of new disturbance (810 acres of which is wolverine habitat) and approximately 859 acres of redisturbance to historic mining areas. The mine site and associated infrastructure would reduce habitat quality or displace resident and transient wolverines around the perimeter of the mine site, because wolverines typically avoid crossing large openings, such as clear-cuts, roadways, and developed areas (Banci 1994; Luensmann 2008; Scrafford et al. 2018). Because wolverines have been observed in the wolverine analysis area, and several individual wolverines have been captured, collared, and tracked via GPS in the PNF and BNF adjacent to the wolverine analysis area (Forest Service 2012a, 2015e; Heinemeyer et al. 2017), it is likely that wolverines would be directly affected through loss of quality habitat or displacement around the mine site.

Noise and light also could directly disturb potential wolverine foraging or denning behavior throughout the life of the SGP. Sustained levels of human disturbances, especially noise due to operations and helicopter flights to assist with exploratory drilling, is expected to contribute to increased levels of displacement of individual wolverines in the wildlife analysis area. Based on the analysis presented in Section 4.6, noise levels would be ambient levels within 1 to 2 miles of the mine site but would attenuate below ambient levels beyond 2 miles. The noise and light reduction strategies employed in the SGP area would reduce impacts on wolverines by minimizing the intensity and duration but would not completely eliminate them.

Access Roads

Direct impacts on wolverines are likely along the access roads due to habitat loss by access road construction, year-round vehicle traffic causing disturbance and potential avoidance behavior, over-snow recreation in the winter and new construction and plowing of the Burntlog Route through potential suitable habitat. Wolverines typically use remote areas that are not fragmented by roadways or other linear disturbances (Scrafford et al. 2018), and they have shown an aversion to crossing roadways with ROWs over 328 feet (100 meters) in width (Luensmann 2008). The Burnt Log (FR 447) and Thunder Mountain (FR 50375) roads would be widened to 26 feet wide, including shoulders, which is significantly narrower than 328 feet. Austin (1998) found that wolverines avoided areas within 100 meters of the Trans-Canada Highway and showed low use of areas within 1,000 meters (i.e., approximately 0.6 mile) of it. Scrafford and Boyce (2014) found that wolverines in northern Alberta tended to avoid areas within 300 meters (i.e., approximately 1,000 feet) of roadways, but regularly crossed paved roads with more than 100 vehicles per day (vpd). Traffic levels on the Burntlog Route would be highest during construction at about 65 vpd. Perpetua would limit their vehicle traffic outside the mine site to between 5:00 am and 7:00 pm resulting in approximately five mine-related vehicles traveling on Burntlog Route per hour during operations. Additionally, Squires et al. (2006) observed that wolverines in southwestern Montana crossed major roadways in areas with the narrowest distance between forest cover on each side. Construction of 15 miles of new road for the Burntlog Route would fragment habitat but may not act as a barrier to
movement due to its width and adjacent tree cover. Upon closure, the new segment of Burntlog Route would be recontoured and reclaimed, which would reduce direct and indirect impacts in the long-term.

An increase in big or small game collision mortality along roadways would be likely as the Burntlog Route segment would be new to the area and would be plowed throughout the winter. Because wolverines are largely scavengers in the winter (particularly on ungulate carrion), this could attract wolverines to roadways. Vehicle-wildlife collisions and habitat fragmentation would likely be the largest impact on the wolverine related to the 2021 MMP. Appropriate speed limits (i.e., generally 30 miles per hour [mph] or less) would be established for the Burntlog Route, mine site haul roads, and light vehicle access roads for the 2021 MMP to reduce the possibility of vehicle-wildlife collisions. All staff and contractors would be trained to reduce wildlife collisions. However, wildlife-vehicle collisions would still be possible. Removing wildlife collision mortality from roadways also could reduce some impacts.

Additionally, Heinemeyer et al. (2017) observed that wolverines responded negatively to increasing intensity of winter recreation in Idaho, Montana, and Wyoming; and that off-road or dispersed recreation triggered a stronger response than recreation concentrated on access roads. Female wolverines showed a stronger avoidance effect to motorized off-road recreation than males, and therefore experienced higher habitat loss (Heinemeyer et al. 2019). Kortello et al. (2019) also documented the negative association of forestry roads and winter recreation on wolverine distribution in the southern Columbia Mountains of Canada. The existing 11-mile groomed OSV trail from Warm Lake to Landmark would be closed under the 2021 MMP, and an approximately 10.4-mile groomed trail would utilize the existing Cabin Creek Road (FR 467). This trail would cross modeled habitat for wolverines, and associated increased recreational activity (e.g., snowmobiling, skiing, etc.) would likely cause indirect impacts to wolverines due to noise from OSVs as this would be a new winter route. Wolverines affected physically (i.e., habitat disturbance due to construction of the Burntlog Route) or behaviorally (i.e., displacement) would likely avoid the areas by moving away from the activities, which could have an impact on denning females. Public use of some roadways would likely also encourage additional backcountry recreational activities and hunting (e.g., big game, small game), which could cause direct mortality (i.e., vehicle collisions or illegal hunting [wolverines do not have a hunting season in Idaho]) or avoidance behavior.

Noise and increased lighting also could disturb potential wolverine foraging or denning habitat throughout the life of the SGP, but the area disturbed would be small relative to equivalent habitat in the contiguous forest area, and relative to the extremely large home range of wolverines (from 49 to 833 square miles; Heinemeyer et al. 2017). However, construction of the access roads would likely produce noise effects at farther distances. For example, as discussed in Section 4.6, noise from access road construction would attenuate to the threshold of 55 dBA approximately 0.57 miles from the source of activity based on distance alone; accounting for ground and atmospheric absorption, noise would attenuate to 55 dBA approximately 0.28 mile from the source. Estimated average hourly traffic noise levels would be approximately 48 dBA at 50 feet from the roadway and would attenuate to below ambient noise levels of 40 dBA within 500 feet from the roadway (Forest Service 2022d). Therefore, traffic noise could affect wolverines in the FCRNRW within 500 feet of the roadway during operations. The noise and light reduction employed along access roads would likely reduce impacts on wolverines by minimizing the intensity and duration but may not eliminate them entirely (Section 2.4.9).
The year-round maintenance and winter plowing of the Burntlog Route could potentially open new and more remote areas for other predators, such as wolves or coyotes, which could indirectly increase the competition for food resources with wolverines.

**Utilities**

Direct impacts on wolverines due to the utility corridors, substations, and communication towers are possible, and construction activities may cause wolverines to avoid these areas in the short-term. Some habitat would be removed for these areas along roadways, but they are not considered good habitat for wolverines due to their roadside location. The addition of new utility access roads, as well as new transmission lines and upgraded transmission lines would likely be a threat to individual wolverines. Upon closure, the new transmission line between the mine site and Johnson Creek substation would be decommissioned, removed, and reclaimed, which would reduce long-term impacts under the 2021 MMP.

Noise and light due to construction of utility corridors, substations, and communication towers could temporarily disturb potential wolverine foraging habitat, but the area disturbed would be small relative to equivalent habitat in the contiguous forest area, and relative to the extremely large home range of wolverines (from 49 to 833 square miles; Heinemeyer et al. 2017). For example, noise would attenuate to the threshold of 55 dBA approximately 0.28 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from transmission line construction would attenuate to 55 dBA approximately 0.15 mile from the source of activity (Forest Service 2022d). The noise and light reduction strategies employed along utility corridors and near communication towers would reduce impacts on wolverines but may not entirely eliminate them.

**Off-site Facilities**

Direct impacts on wolverines due to off-site facilities are possible, as there are known breeding territories in the wolverine analysis area, and they would likely travel throughout the area. Because wolverines typically use remote areas that are not fragmented by roadways or buildings, it is likely that resident or transient wolverine individuals would naturally avoid the off-site facility areas. There could be some displacement and avoidance of more remote facilities (e.g., Landmark Maintenance Facility).

Noise and increased lighting near the off-site facilities may disturb potential wolverine foraging or denning habitat although the area disturbed would be small relative to equivalent habitat in the contiguous forest area, and relative to the extremely large home range of wolverines. It is likely that resident or transient wolverine individuals would avoid the off-site facilities.

Traffic associated with the facilities may increase the potential for vehicle-wildlife collisions. All employees and contractors would be trained to reduce wildlife collisions. Any adverse wildlife encounters would be reported to appropriate state and federal wildlife managers, and in accordance with state and federal laws.
Monarch Butterfly

Direct impacts on the Monarch butterfly could include direct mortality (i.e., wildlife-vehicle collisions) or loss of habitat due to land clearing activities and land use changes. Indirect impacts could include reduced use of foraging habitat or reduced pollinator resources in the analysis area.

The 2021 MMP may directly and indirectly impact Monarch butterflies and habitat. However, due to the low potential for this species to occur in the wildlife analysis area, primarily due to a lack of suitable habitat, the 2021 MMP would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the Monarch butterfly and its habitat, the 2021 MMP would result in negligible impacts to the Monarch butterfly.

Mine Site

Direct effects on Monarch butterflies would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, and increased human activity under the 2021 MMP. Displaced individuals would likely only be lost to the population if the adjacent environment were at maximum carrying capacity, to the extent that there were not enough available habitats to support them. In such a case, individuals would have to travel further, exposing them to predation, vehicle-wildlife collisions, and energetic loss. Monarch butterflies would likely be displaced around the perimeter of the mine site. Additional roadways in the mine site would expose individuals to direct vehicle collisions or increased predation in the wildlife analysis area.

Light and noise impacts associated with mine site activities are likely to disturb or displace Monarch butterflies. The estimated total average hourly noise levels from the mine site during the operations phase would be 102 dBA with blasting (Forest Service 2022d). Under the blasting scenario, SGP-related noise levels from the mine site during operations would attenuate to well below average ambient sound levels, because the impacts are reduced by vegetation, topography, and distance from the impact sources. Noise-reduction strategies would be used to reduce indirect effects on wildlife. Several terrestrial wildlife species have shown responses to anthropogenic noise levels beginning at 40 dBA (Shannon et al. 2016). However, because the existing (ambient) sound levels vary between 20 and 40 dBA, it is likely that SGP area wildlife, including the Monarch butterfly, would have a higher tolerance for noise. Equipment would have limited external lighting and would employ noise-minimizing practices.

Hazardous materials and chemicals would be transported to the mine site in USDOT-certified containers by trained personnel and would be stored in designated areas employing secondary containment measures. A Hazardous Materials Handling and Emergency Response Plan would address procedures for responding to accidental spills or releases of hazardous materials to minimize environmental effects. Used products would be stored on site in approved containers that would be separate from other trash and garbage products. Therefore, there is little chance of Monarch butterflies being exposed to hazardous materials.

Access Roads

Direct effects on the Monarch butterfly would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, fugitive dust, and
increased human activity under the 2021 MMP. Construction of 15 miles of new road for the Burntlog Route would likely fragment habitat for the Monarch butterfly. The new 15-mile-long section of Burntlog Route would be constructed and maintained year-round and have an AADT level of 68 vehicles, which would likely directly disrupt Monarch butterfly movements. The intensity of this impact could range from minor displacement to mortality. The duration ranges from temporary road construction to short-term. It is not expected that the increased risk of injury or mortality would become permanent, because the new segment of the Burntlog Route would be reclaimed, and traffic levels on the existing roads would return to current levels. The geographic extent of these impacts would be limited to the vicinity of the access road.

Light, noise, and fugitive dust (potentially high levels depending on phase of the Project) impacts associated with road construction, maintenance, and vehicle traffic are likely to disturb or displace the Monarch butterfly. SGP design features would help reduce these impacts, but not eliminate them. The estimated noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA. The estimated SGP-related noise level from road maintenance activity on the mine access road would range up to 88 dBA during the summer months (Forest Service 2022d).

**Utilities**

Direct impacts on Monarch butterflies could include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes under the 2021 MMP. The addition of new utility access roads, as well as new transmission lines and upgraded transmission lines, could impact individual Monarch butterflies. Construction impacts would likely displace wildlife but would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable. Noise-reduction strategies would be used to reduce indirect effects.

**Off-site Facilities**

Construction and operation of the off-site facilities under the 2021 MMP are unlikely to disturb Monarch butterflies, because construction activities are not planned to occur in suitable habitat used by them. Noise and lighting reduction strategies would be used to reduce indirect effects on species in the vicinity.

Although construction and operation of the off-site facilities themselves would likely not cause direct mortality to Monarch butterflies, vehicle traffic associated with the facilities could result in mortality.

**Focal Species, Including Region 4 Sensitive Species and Management Indicator Species**

**Habitat Family 1 – Low Elevation, Old Forest**

**White Headed Woodpecker**

Modeled habitat for the White-headed Woodpecker is shown in Figure 3.13-8 with impacted acreages shown in Table 4.13-3.
Mine Site

The white-headed woodpecker is expected to be uncommon in the wildlife analysis area. Modeled habitat for white-headed woodpecker does not occur in the Operations Area Boundary and direct impacts are unlikely.

The 2021 MMP would cause an increase in noise and light in the vicinity of the Operations Area Boundary, which could cause indirect effects to white-headed woodpecker within 0.5 mile of the mine site. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest would constitute “take”) or foraging changes. Noise-reduction strategies would be used to lower potential indirect effects on woodpeckers.

Table 4.13-3 White-headed Woodpecker Direct and Indirect Impacts

<table>
<thead>
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<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
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<tr>
<td></td>
<td>2021 MMP</td>
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</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
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<tr>
<td>Access Roads</td>
<td>4</td>
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<tr>
<td>Utilities</td>
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<tr>
<td>Off-site Facilities</td>
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<tr>
<td>Total</td>
<td>16</td>
<td>1,473</td>
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</table>

|                        | Johnson Creek Route Alternative          |                                            |
|------------------------|------------------------------------------|                                            |
| Mine Site              | 0                                        | N/A                                        |
| Access Roads           | 17                                       | N/A                                        |
| Utilities              | 12                                       | N/A                                        |
| Off-site Facilities    | 0                                        | N/A                                        |
| Total                  | 29                                       | 1,485                                      |

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (0.5 mile for woodpeckers) and occur outside of the SGP components.

Access Roads

There is very limited modeled habitat for white-headed woodpecker near the proposed Burntlog Route, so there would be only low direct impacts for the access roads (4 acres; Table 4.13-3). The 2021 MMP would cause an increase in noise and light in the wildlife analysis area due to road construction, vehicle traffic, and maintenance. However, most modeled habitat is adjacent to existing roadways (e.g., Warm Lake Road). Wildlife behaviors that may change as a result of increased noise, light, and fugitive dust due to increased traffic include nesting (loss of a nest equals “take”) and/or foraging changes. Noise-reduction strategies would be used to lower indirect effects on woodpeckers (Section 2.4.9).

Utilities

There is very limited modeled habitat for white-headed woodpecker along the utility areas, so there would be very little direct impacts (approximately 12 acres; Table 4.13-2). Direct take of adult birds, nests,
... eggs, or young due to construction or operational activities is unlikely, because white-headed woodpeckers are expected to be uncommon.

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, due to construction, operation, and maintenance of the utilities, particularly along the new transmission line between the mine site and Johnson Creek substation (where some modeled habitat occurs). Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Noise-reduction strategies would be used to lower indirect effects on woodpeckers.

**Off-site Facilities**

The 2021 MMP is unlikely to disturb individual white-headed woodpeckers due to clearing and construction activities for off-site facilities, because none are expected to impact modeled habitat. However, indirect effects on woodpeckers could include reduced use of foraging or nesting habitat.

**Lewis’s Woodpecker**

Modeled habitat for the Lewis’s Woodpecker is shown in Figure 3.13-9 with impacted acreages shown in Table 4.13-4.

**Table 4.13-4  Lewis’s Woodpecker Direct and Indirect Impacts**

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2021 MMP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11</td>
<td>1,340</td>
</tr>
<tr>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>19</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25</td>
<td>1,345</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (0.5 mile for woodpeckers) and occur outside of the SGP components.

**Mine Site**

Effects to the Lewis’s woodpecker at the mine site would be similar to the white-headed woodpecker analysis. No modeled habitat would be impacted in the mine site area (Table 4.13-4).
Access Roads
Effects to the Lewis’s woodpecker along the access roads under the 2021 MMP would be similar to the white-headed woodpecker analysis. Approximately 5 acres of modeled habitat would be impacted along the access roads.

Utilities
Effects to the Lewis’s woodpecker associated with the utilities under the 2021 MMP would be similar to the white-headed woodpecker analysis. Approximately 6 acres of modeled habitat would be impacted along the access roads.

Off-site Facilities
There would be no effects to the Lewis’s woodpecker due the off-site facilities under the 2021 MMP.

Habitat Family 2 – Broad Elevation, Old Forest
American Three-toe Woodpecker

Modeled habitat for the American three-toed Woodpecker is shown in Figure 3.13-10 with impacted acreages shown in Table 4.13-5.

Table 4.13-5 American Three-toed Woodpecker Direct and Indirect impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>30</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>17</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57</strong></td>
<td><strong>2,724</strong></td>
</tr>
</tbody>
</table>

Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
<td>29</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>17</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
<td><strong>2,224</strong></td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (0.5 mile for woodpeckers) and occur outside of the SGP components.

The 2021 MMP would cause an increase in noise and light in the woodpecker analysis area, due to construction, operation, and maintenance of the utilities. Wildlife behaviors that may change as a result of increased noise and light include nesting (loss of a nest equals “take”) and/or foraging changes. Noise-reduction strategies would be used to reduce indirect effects on woodpeckers.
Mine Site

While there is modeled habitat for American three-toed woodpeckers in the mine site area, there are no documented occurrences, and they are expected to be rare. However, there would be a direct impact of 30 acres of modeled habitat in the mine site area for American three-toed woodpeckers under the 2021 MMP (Table 4.13-5). Removal of snag trees would cause a loss of suitable habitat for this species, which would likely displace resident birds. Adjacent areas contain similar habitat types, but individual birds may face more competition for these areas, which would be an indirect effect. Direct take of adult birds due to construction or operational activities is possible, but unlikely, because most individuals are expected to avoid areas of activity and they are rare in the mine site area. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. To the extent practicable, trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce impacts, there would still be a decrease in modeled habitat.

The 2021 MMP would cause an increase in noise and light in the woodpecker analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Noise-reduction strategies would be used to reduce indirect effects on woodpeckers.

Access Roads

There would be a direct impact of 10 acres to modeled habitat along the Burntlog Route for American three-toed woodpeckers under the 2021 MMP (Table 4.13-4). Removal of snag trees along this roadway would cause a loss of suitable habitat for this species. Direct take of adult birds due to construction or operational activities is unlikely because they are expected to be uncommon. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. To the extent practicable, trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce impacts, there would still be a decrease in habitat.

The 2021 MMP would cause an increase in noise, light, and fugitive dust in the woodpecker analysis area, due to road construction, vehicle traffic, and maintenance. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Noise-reduction strategies would be used to lower indirect effects on woodpeckers. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt American three-toed woodpeckers due to OSV noise.

Utilities

There would be a direct impact of 17 acres of modeled habitat along the utilities for American three-toed woodpeckers under the 2021 MMP (Table 4.13-5). Removal of snag trees near utility corridors, substations, and communication towers would cause a loss of suitable habitat for this species, which would likely displace any resident birds. Adjacent areas contain similar habitat types, but individual birds
may face more competition for these areas, which would be an indirect effect. Direct take of adult birds due to construction or operational activities is unlikely because they are expected to be uncommon. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. This could occur along the new transmission line segment between the mine site and Johnson Creek substation or along the upgraded transmission line segments along Johnson Creek Road and Warm Lake Road. To the extent practicable, trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce impacts, there would still be a decrease in habitat.

Off-site Facilities

The 2021 MMP is unlikely to disturb individual American three-toed woodpeckers due to clearing and construction activities for off-site facilities, because none of the facilities are expected to overlap modeled habitat. However, indirect effects on woodpeckers could include reduced use of foraging or nesting habitat within 0.5 mile of the off-site facilities due to noise and light.

Black-backed Woodpecker

Modeled habitat for the black-backed Woodpecker is shown in Figure 3.13-11 with impacted acreages shown in Table 4.13-6.

Table 4.13-6  Black-backed Woodpecker Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>2021 MMP</strong></td>
<td><strong>Johnson Creek Route Alternative</strong></td>
</tr>
<tr>
<td>Mine Site</td>
<td>49</td>
<td>45</td>
</tr>
<tr>
<td>Access Roads</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Utilities</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td><strong>Indirectly Impacted Modeled Habitat</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>7,420</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>6,244</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.

N/A = indirect impacts are calculated by buffer distances (0.5 mile for woodpeckers) and occur outside of the SGP components.

Mine Site

Effects to the black-backed woodpecker at the mine site would be similar to the American three-toed woodpecker analysis. However, there would be a direct impact of 49 acres of modeled habitat under the 2021 MMP (Table 4.13-6).
Access Roads
Effects to the black-backed woodpecker along the access roads would be similar to the American three-toed woodpecker analysis. The 2021 MMP would have a direct impact of 20 acres (Table 4.13-5). This would primarily occur due to construction of the Burntlog Route through modeled habitat. Indirect impacts (due to noise, light, and fugitive dust from construction and increased traffic) would occur within 0.5 mile of the Burntlog Route as well.

Utilities
Effects to the black-backed woodpecker associated with the utilities would be similar to the American three-toed woodpecker analysis.

Off-site Facilities
Effects to the black-backed woodpecker at the off-site facilities under the 2021 MMP would be similar to the American three-toed woodpecker analysis.

Dusky Grouse

Figure 3.13-12 and Table 4.13-7 shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat.

Table 4.13-7 Dusky Grouse (Summer) Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>9,045</td>
</tr>
<tr>
<td></td>
<td>Johnson Creek Route Alternative</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>68</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>208</td>
<td>9,042</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for dusky grouse) from the action alternatives and occur outside of the SGP components.

Mine Site
Modeled summer habitat for dusky grouse is limited and occurs only in the northern portion of the Operations Area Boundary. However, no modeled habitat would be directly impacted by the 2021 MMP in the Operations Area Boundary.
The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Dusky grouse behaviors that may change as a result of increased noise and light include changes in nesting (loss of a nest equals “take”) and/or foraging patterns that could lead to fragmentation of habitat. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Additionally, light and noise impacts are reduced by vegetation, topography, and distance from the impact sources. Therefore, indirect impacts on dusky grouse would differ depending on the specific conditions at each individual 2021 MMP component location based on the density of vegetation and proximity to adjoining hillsides and valleys.

Direct and indirect effects for dusky grouse would likely be exposure to emissions and a reduction in insects due to emissions, which could affect dusky grouse during the brood-rearing season (summer).

Insects and insectivorous birds may be exposed to metals (e.g., mercury) and other elements from atmospheric emissions and tailings piles associated with gold and silver mining activities (Custer et al. 2009; Eagles-Smith et al. 2018; Jones and Miller 2005). Emissions of metals from mine operations and ore processing, in the form of particulate matter and dust, may be deposited directly on local soils and waterways. In addition, rainwater and snow melt may provide a pathway for these elements to leach from tailings piles or be physically transported as solid particles into adjacent waterbodies. These elements may enter the food web through plants and insects and then be consumed by insectivorous wildlife, potentially causing injury if exposure is sufficient, therefore, there would likely be direct and indirect impacts to insectivorous birds like the dusky grouse.

**Access Roads**

The 2021 MMP could directly disturb dusky grouse in the wildlife analysis area through habitat removal and disturbance. The new segment of the Burntlog Route would be decommissioned and reclaimed during mine closure, but the effects would still be considered permanent due to the long time period. The Burntlog Route does not cross much modeled suitable habitat, but there would still be approximately 20 acres of direct impacts (Table 4.13-7). The construction traffic (AADT of 65) and operation traffic (AADT of 50) associated with the workforce, supplies, haulage, and other miscellaneous traffic, including road maintenance on the access roads, could expose individual dusky grouse to vehicle-wildlife collisions.

Also, noise and light disturbance from road construction, road maintenance, and routine vehicle traffic may disturb or displace individual grouse where they occur. Dusky grouse behaviors that may change as a result of increased noise and light include changes in nesting (loss of a nest equals “take”) and/or foraging patterns that could lead to fragmentation of habitat.

Another indirect impact to dusky grouse along access roads could include fugitive dust. Dust associated with construction of facilities and roads, road maintenance, and vehicle travel may have indirect impacts on wildlife forage (e.g., plants and insects) (Section 4.10). Increased dust deposition could result in negative impacts on wildlife foods ranging from plant metabolic process inhibition, plant mortality, inhibition of pollination, or injury to pollinating insects. For SGP, the potential for dust deposition is likely to be higher in the immediate area of roads and other surface-disturbing actions but would diminish with distance from these actions. Dust impacts on wildlife forage plants and insects would start during
construction and continue through closure and reclamation. Some dust deposition also may occur in the post-closure period where monitoring-related travel on dirt roads would occur; however, this would be negligible. Effects of dust on plants and insects would occur immediately at the time of dust propagating activities and is likely to continue throughout the lifetime of SGP.

**Utilities**

The 2021 MMP would directly disturb dusky grouse in the wildlife analysis area through habitat loss due to clearing and construction activities for utility corridors, substations, and communication towers. Direct impacts would include 140 acres of modeled habitat along the utility features (Table 4.13-7). During operations, the utility ROWs would be maintained in a low vegetation growth stage, which could provide summer nesting or brood-rearing habitat for dusky grouse.

Noise and light disturbance from construction of the utility corridors, substations, and communication towers may temporarily disturb or displace individuals. These indirect effects would be considered temporary during construction. Once the construction is complete, it is expected that dusky grouse would resume use of the area.

Existing substations, structures, and upgraded transmission lines would exist in perpetuity. The new transmission line segment between the mine site and Johnson Creek substation (as well as the substation itself) would be removed and the area recontoured and reclaimed upon closure, which would reduce impacts after the life of the mine.

**Off-site Facilities**

There would be no direct impacts to modeled habitat due to the off-site facilities under the 2021 MMP. Construction and operation of the off-site facilities is also unlikely to have indirect effects on dusky grouse, as modeled habitat is limited within 1 mile of the off-site facilities.

**Boreal Owl**

Figure 3.13-13 shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (Table 4.13-8).

The 2021 MMP may directly and indirectly impact boreal owl individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. The 2021 MMP would directly impact 37 acres of habitat. Therefore, based on the impact analysis for the boreal owl and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the boreal owl.

**Mine Site**

Boreal owls are known to occur and breed in the mine site area, and modeled habitat occurs as well. The 2021 MMP may directly disturb boreal owls in the wildlife analysis area through habitat loss, disturbance from increased human activity, and helicopter use associated with some exploratory drilling support.
### Table 4.13-8 Boreal Owl Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2021 MMP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>9</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>8</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>9,175</td>
</tr>
<tr>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>15</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>13</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>8</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>7,755</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for owls) and occur outside of the SGP components.

Approximately 20 acres of modeled habitat would be directly impacted or removed at the mine site under the 2021 MMP (Table 4.13-8). Direct take of adult birds due to construction or operational activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. To the extent practicable, trees found to contain nests or cavities (often used by boreal owls) would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Timing restrictions would restrict some activities within a certain radius of active nest trees for raptor species, which would help reduce habitat impacts. For example, the Forest Service would require restricting activities between March 1 and July 30 which occur up to 1,500 feet from active boreal owl nest sites, and a 350-foot ground disturbance buffer would be maintained around active nests, with some exceptions (Section 2.4.9). Although design features would reduce impacts, there would still be a decrease in modeled habitat.

The boreal owl also could be impacted by direct collision risks with structures at the mine site. Electric transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted).

The 2021 MMP would cause an increase in noise, light, and emissions in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Bright lighting can disrupt feeding activities for many owl species. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Therefore, indirect impacts on wildlife...
would differ depending on the specific conditions at each individual 2021 MMP component location based on the density of vegetation and proximity to adjoining hillsides and valleys.

A possible indirect effect is that there could be a reduction in insects as prey species near the mine site activities. Any actions resulting in a decrease to insects could impact the boreal owl, including direct removal of foraging habitat (e.g., understory vegetation) or effects from fugitive dust and emissions.

Insects and insectivorous birds may be exposed to metals (e.g., mercury) and other elements from atmospheric emissions and tailings piles associated with gold and silver mining activities (Custer et al. 2009; Eagles-Smith et al. 2018; Jones and Miller 2005). Emissions of metals from mine operations and ore processing, in the form of particulate matter and dust, may be deposited directly on local soils and waterways. In addition, rainwater and snow melt may provide a pathway for these elements to leach from tailings piles or be physically transported as solid particles into adjacent waterbodies. These elements may enter the food web through plants and insects and then be consumed by insectivorous wildlife, potentially causing injury if exposure is sufficient, therefore, there would likely be indirect impacts to insectivorous birds like the boreal owl.

**Access Roads**

The 2021 MMP could disturb individual boreal owls in the wildlife analysis area through direct habitat loss (9 acres) due to tree clearing, road construction, and increased human activity along the access roads (Table 4.13-8). Direct take of adult birds due to these activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. Timing restrictions described for the mine site would be used to reduce impacts.

Additionally, increased vehicle traffic is likely to disturb or displace individuals from roadside habitats. Plowing of the Burntlog Route over the winter would introduce additional noise and disturbance, which could affect wintertime use by boreal owls. Noise-reduction strategies would be used to reduce indirect effects on owls. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt boreal owls due to OSV noise.

**Utilities**

The 2021 MMP could disturb individual boreal owls in the wildlife analysis area through direct habitat loss (8 acres) due to clearing and construction activities for utility corridors, substations, and communication towers. Direct take of adult birds due to these activities is unlikely because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. Timing restrictions described for the mine site would be used to reduce impacts.

The cell tower, communication tower, repeater sites, and new or upgraded 138-kV transmission line would be a potential source of mortality for boreal owls (APLIC 2012). In the long term, the transmission line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted). However, the long-term presence of structures and communication towers would pose a
risk of collision and direct mortality. Upon closure, the new segment of transmission line between the mine site and Johnson Creek substation would be reclaimed.

Noise and light from construction of the utility corridors, substations, and cell tower, and repeater sites is likely to disturb or displace individuals. However, construction of these areas would be temporary, and it is not expected to become a barrier to long-term movement or to fragment habitat. Once the construction is complete, it is expected that owls would resume use of the area.

**Off-site Facilities**

The 2021 MMP would not have any direct impacts on modeled habitat due to clearing and construction activities for off-site facilities. Modeled habitat within 1 mile of the off-site facilities is limited, but the 2021 MMP could disturb individual boreal owls in the wildlife analysis area through noise increases due to construction or operation of the off-site facilities. Noise-reduction strategies would be used to lower indirect effects on the boreal owl. Lighting BMPs would be used to reduce indirect effects on sensitive wildlife species (*Section 2.4.9*). Buildings would have limited external lighting and would employ noise-minimizing practices.

*Fisher*

**Figure 3.13-14** shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (*Table 4.13-9*).

The 2021 MMP may directly and indirectly impact fisher individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the fisher and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the fisher.

**Mine Site**

Approximately 30 acres of direct impacts to modeled habitat would occur in the mine site under the 2021 MMP (*Table 4.13-9*). Olson et al. (2014) observed that although fishers are capable of long-distance dispersal movements (e.g., 6.2 miles), large expanses of non-favorable habitat may prevent them from doing so and become a barrier to movement. As the mine site would be approximately 6 miles long by 1 mile wide, it could fragment habitat.

These same effects also could reduce prey availability or redistribute their populations in the wildlife analysis area, causing them to travel further for foraging opportunities, which would indirectly affect the fisher. Noise and light at the mine site could also indirectly impact fishers.
Table 4.13-9  Fisher Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>30</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>14</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>5,866</td>
</tr>
<tr>
<td></td>
<td>Johnson Creek Route Alternative</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>30</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>14</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>&lt;1</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>4,767</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for fisher) and occur outside of the SGP components.

Access Roads
Approximately 10 acres of direct impacts to modeled habitat would occur along the access roads under the 2021 MMP (Table 4.13-9). The new 15-mile-long section of Burntlog Route would be used and plowed year-round; and along with all other access roads and other roads used for the SGP, would likely represent an increased potential for vehicle collisions as this species has been documented at wolverine monitoring stations along the existing Burnt Log Road. All employees and contractors would be trained to reduce wildlife collisions. The AADT for the 2021 MMP would be approximately 65 during construction and 50 during operations. There also is the potential for an increase in trapping, resulting from increased access in remote areas. Restricting public access on the Burntlog Route and removing roadkill from roadways would likely reduce the chance of mortality (Section 2.4.9). These same effects also could reduce prey availability in the SGP area, which would indirectly affect the fisher. Upon reclamation, the new section of the Burntlog Route would be decommissioned, re-contoured, and seeded to resemble pre-mining conditions, although the vegetation would likely continue to be dominated by grasses and forbs for many years. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt fishers due to OSV noise.

Utilities
Approximately 14 acres of direct impacts to modeled habitat would occur along the utilities under the 2021 MMP (Table 4.13-9). Direct impacts on the fisher would include disturbance or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes. Direct impacts would occur along new transmission lines (between the mine site and Johnson Creek substation) and along upgraded transmission lines (between Johnson Creek Road and the Thunderbolt Tap substation, and along Warm Lake Road). Construction impacts would likely displace individual fishers farther distances but displacement would be temporary. Vegetation would be cleared.
only in those areas necessary for the 2021 MMP activities to preserve natural habitat to the greatest extent practicable. During operations, vegetation would be maintained in a low vegetation growth stage, and fishers would likely use the area again.

After mine closure is complete, the 8.5-mile new transmission line between the mine site and Johnson Creek substation would be removed, and fishers could continue to use modeled habitat in the area.

Off-site Facilities

Construction and operation of the off-site facilities for the 2021 MMP are unlikely to disturb the fisher, because construction activities are not planned to occur in modeled habitat. However, noise and light reduction strategies would be used to reduce indirect effects on them, as modeled habitat does occur adjacent to the Landmark Maintenance Facility.

Flammulated Owl

Figure 3.13-15 shows the components of the 2021 MMP and Johnson Creek Route Alternative within the wildlife analysis area compared to modeled habitat (Table 4.13-10).

Table 4.13-10 Flammulated Owl Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>41</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>6,507</td>
</tr>
</tbody>
</table>

|                          | Johnson Creek Route Alternative           |                                             |
| Mine Site                | 1                                        | N/A                                         |
| Access Roads             | 22                                       | N/A                                         |
| Utilities                | 41                                       | N/A                                         |
| Off-site Facilities      | 0                                        | N/A                                         |
| Total                    | 64                                       | 6,507                                       |

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for owls) and occur outside of the SGP components.

The 2021 MMP may directly and indirectly impact flammulated owl individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the flammulated owl and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the flammulated owl.
**Mine Site**

The 2021 MMP could directly disturb 1 acre of modeled habitat in the mine site area (Table 4.13-10), as modeled habitat is limited in this area. However, flammulated owls are known to occur in the wildlife analysis area. Direct take of adult birds due to construction or operational activities is unlikely because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. To the extent practicable, trees found to contain nests or cavities (often used by flammulated owls) would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered.

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Bright lighting can disrupt feeding activities for many owl species. Because flammulated owls are primarily nocturnal, they also could be impacted by direct collision risks with structures at the mine site due to lighting. Transmission line structures to serve facilities under the 2021 MMP would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted).

A likely indirect effect is that there could be a reduction in prey species near the mine site activities and along access routes. Any actions resulting in a decrease to insects could impact the flammulated owl, including direct removal of foraging habitat or effects from fugitive dust and emissions. Flammulated owls are highly migratory and would primarily be impacted during the breeding season (mid-May to mid-August).

Insects and insectivorous birds, such as the flammulated owl, may be exposed to metals (e.g., mercury) and other elements from atmospheric emissions and tailings piles associated with gold and silver mining activities (Custer et al. 2009; Eagles-Smith et al. 2018; Jones and Miller 2005). Emissions of metals from mine operations and ore processing, in the form of particulate matter and dust, may be deposited directly on local soils and waterways. In addition, rainwater and snow melt may provide a pathway for these elements to leach from tailings piles or be physically transported as solid particles into adjacent waterbodies. These elements may enter the food web through plants and insects and then be consumed by insectivorous wildlife, potentially causing injury if exposure is sufficient, therefore, there would likely be indirect impacts to insectivorous birds like the flammulated owl.

**Access Roads**

The 2021 MMP could disturb individual flammulated owls in the wildlife analysis area through direct habitat loss (3 acres; Table 4.13-10) due to tree clearing, road construction, and increased human activity in the access roads. Direct take of adult birds due to these activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is likely that nests, eggs, and young would be directly disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. Additionally, increased vehicle traffic is likely to directly disturb or displace individuals from roadside habitats.
Noise-reduction strategies would be used to reduce indirect effects on owls. Cutting of trees for 2021 MMP activities would avoid avian tree nests, where feasible; and a Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce direct impacts, there would still be a decrease in habitat due to construction of the Burntlog Route.

Another indirect impact to flammulated owls along access roads could include fugitive dust. Dust associated with construction of facilities and roads, road maintenance, and vehicle travel may have indirect impacts on owl prey ([Section 4.10](#)). Increased dust deposition could result in negative impacts on wildlife foods ranging from plant metabolic process inhibition, plant mortality, inhibition of pollination, or injury to pollinating insects. For SGP, the potential for dust deposition is likely to be higher in the immediate area of roads and other surface-disturbing actions but would diminish with distance from these actions. Dust impacts on wildlife forage plants and insects would start during construction and continue through closure and reclamation. Some dust deposition also may occur in the post-closure period where monitoring-related travel on dirt roads would occur; however, this would be negligible. Effects of dust on plants and insects would occur immediately at the time of dust propagating activities and is likely to continue throughout the lifetime of the SGP.

**Utilities**

The 2021 MMP could disturb individual flammulated owls in the wildlife analysis area through direct impacts of 41 acres to modeled habitat due to clearing and construction activities for utility corridors, substations, and communication towers. Direct take of adult birds due to these activities is unlikely because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young would be disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. To the extent practicable, trees found to contain nesting cavities would not be disturbed or cut. No trees with active nests would be cut.

The cell tower, communication tower, repeater sites, and new 138-kV transmission line would be a potential source of mortality for flammulated owls ([APLIC 2012](#)). The utility line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Electric transmission line structures to serve facilities under the 2021 MMP would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted). However, the long-term presence of structures and communication towers would pose a risk of collision and direct mortality. Upon closure and reclamation, the new transmission line between the mine site and Johnson Creek substation would be removed, which would eliminate these impacts.

Noise and light from construction of the utility corridors, substations, and communication towers is likely to disturb or displace individuals. However, construction of these areas would be temporary and is not expected to become a barrier to long-term movement or to fragment habitat. Once the construction is complete, it is expected that owls would resume use of the area. The noise-reduction strategies described for the mine site and access roads would be employed along utility corridors and near communication towers, which would reduce noise impacts on flammulated owls.
Off-site Facilities

The 2021 MMP are unlikely to impact flammulated owls as there would be no direct impacts to modeled habitat. Additionally, indirect impacts would be unlikely as modeled habitat is very limited within 1 mile of the off-site facilities.

Great Gray Owl

Figure 3.13-16 shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (Table 4.13-11).

Table 4.13-11 Great Gray Owl Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021 MMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>164</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>56</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>270</td>
<td>21,437</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
</tr>
<tr>
<td>Access Roads</td>
</tr>
<tr>
<td>Utilities</td>
</tr>
<tr>
<td>Off-site Facilities</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for owls) and occur outside of the SGP components.

Mine Site

Great gray owls are documented in the area and modeled habitat occurs throughout the wildlife analysis area. The 2021 MMP would result in 164 acres of direct impacts to modeled habitat for great gray owl in the mine site area (Table 4.13-11). Direct take of adult birds due to construction or operational activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. This resident species occasionally nests early in the season (in the snow). To the extent practicable, trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Timing restrictions would restrict some activities within a certain radius of active nest trees for raptor species, which would help reduce habitat impacts. Although design features would reduce impacts, there would still be a decrease in modeled habitat.
The great gray owl also could be impacted by direct collision risks with structures at the mine site. Electric transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted).

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Bright lighting can disrupt feeding activities for many owl species. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Therefore, indirect impacts on wildlife would differ depending on the specific conditions at each individual 2021 MMP component location based on the density of vegetation and proximity to adjoining hillsides and valleys.

**Access Roads**

The 2021 MMP would result in 56 acres of direct impacts to modeled habitat for great gray owl associated with the Burntlog Route (Table 4.13-11). Direct take of adult birds due to these activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. Timing restrictions described for the mine site would be used to reduce impacts.

Additionally, increased vehicle traffic is likely to disturb or displace individuals from roadside habitats. Noise-reduction strategies would be used to reduce indirect effects on owls. Also, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt great gray owls due to OSV noise.

**Utilities**

There would be 50 acres of direct impacts to modeled habitat due to construction of the new substations and new transmission line between the mine site and Johnson Creek substation, in addition to the upgrades to transmission lines and substations between Johnson Creek Road and the Warm Lake substation, and along Warm Lake Road and Johnson Creek Road.

Direct take of adult birds due to these activities is unlikely because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. Timing restrictions described for the mine site would be used to reduce impacts.

The cell tower, communication tower, repeater sites, and new or upgraded transmission lines would be a potential source of mortality for great gray owls (APLIC 2012). In the long-term, the transmission line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted). However, the long-term presence of structures and communication towers would pose a risk of collision and direct mortality. Upon closure and reclamation, the new transmission line between
the mine site and Johnson Creek substation would be removed, which would eliminate some of these impacts.

Noise and light from construction of the utility corridors, substations, and communication towers is likely to disturb or displace individuals within 1 mile of the SGP components. However, construction of these areas would be temporary, and it is not expected to become a barrier to long-term movement or to fragment habitat. Once the construction is complete, it is expected that owls would resume use of the area.

Off-site Facilities

The 2021 MMP would not have any direct impacts on modeled habitat due to clearing and construction activities for off-site facilities. However, the 2021 MMP could disturb individual great gray owls in the wildlife analysis area through noise pollution due to construction or operation of the off-site facilities. Noise-reduction strategies would be used to reduce indirect effects on the owls. Lighting BMPs would be used to reduce indirect effects on sensitive wildlife species.

Northern Goshawk

Figure 3.13-17 shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (Table 4.13-12).

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021 MMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>49</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>15,113</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Creek Route Alternative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>45</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>15</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>12,702</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for raptors) and occur outside of the SGP components.

The 2021 MMP may directly and indirectly impact northern goshawk individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Based on the impact analysis for the northern goshawk and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the northern goshawk.
**Mine Site**

Northern goshawks have been documented but are expected to be uncommon and there are no known nests in the wildlife analysis area. There would be 49 acres of direct impacts to modeled habitat in the mine site area under the 2021 MMP. Direct take of adult birds or nests, eggs, or young due to construction or operational activities is unlikely, as they are thought to be uncommon. However, to the extent practicable, trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Timing restrictions would restrict some activities within a certain radius of active nest trees for raptor species, which would help reduce habitat impacts. For example, the Forest Service would restrict activities within a 30-acre (650-foot radius) area surrounding active nests, with some exceptions (Section 2.4.9). Additionally, drilling operations, roadwork, and helicopter flights would be restricted within a 1,500-foot buffer of active goshawk nests from April 1 to August 15. Although design features would reduce impacts, there would still be a decrease in modeled habitat.

The northern goshawk could also be impacted by direct collision risks with structures at the mine site. Electric transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted).

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include foraging changes.

**Access Roads**

The 2021 MMP would result in 20 acres of direct impacts to modeled habitat for northern goshawk associated with the Burntlog Route (Table 4.13-12). Direct take of adult birds or nests, eggs, or young due to these activities is unlikely, because most individuals are expected to avoid areas of activity and there are no known nests in the area. However, timing restrictions described for the mine site would be used to reduce potential impacts.

Additionally, increased vehicle traffic is likely to disturb or displace individuals from roadside habitats and would cause indirect impacts on northern goshawk. Noise-reduction strategies would be used to reduce indirect effects on raptor species. The 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt northern goshawks due to OSV noise.

**Utilities**

There would be 20 acres of direct impacts to modeled habitat due to construction of the new substations and new transmission line between the mine site and Johnson Creek substation, in addition to the upgrades to transmission lines and substations between Johnson Creek Road and the Warm Lake substation, and along Warm Lake Road and Johnson Creek Road. Direct take of adult birds or nests, eggs, or young due to these activities is unlikely because most individuals are expected to avoid areas of activity and they are not known to nest in the area.
The communication towers and new or upgraded transmission lines would be a potential source of mortality for northern goshawk. However, the transmission line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Upon closure and reclamation, the new transmission line between the mine site and Johnson Creek substation would be removed, which would eliminate some of these collision impacts.

Noise and light from construction of the utility corridors, substations, and communication towers could disturb or displace individuals within 1 mile of the SGP components. However, construction of these areas would be temporary, and it is not expected to become a barrier to long-term movement or to fragment habitat. Once the construction is complete, it is expected that northern goshawks would resume use of the area.

**Off-site Facilities**

The 2021 MMP would not have any direct impacts on modeled habitat due to clearing and construction activities for off-site facilities. Indirect impacts would also be unlikely as modeled habitat is limited within 1 mile of the off-site facilities.

**Pileated Woodpecker**

*Figure 3.13-18* shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (*Table 4-13-13*).

**Table 4.13-13 Pileated Woodpecker Direct and Indirect Impacts**

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1</strong></td>
<td><strong>373</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1</strong></td>
<td><strong>374</strong></td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.

N/A = indirect impacts are calculated by buffer distances (0.5 mile for woodpeckers) and occur outside of the SGP components.
Although modeled habitat is limited in the wildlife analysis area, individuals are present during the breeding season. The 2021 MMP would likely have no direct impacts on pileated woodpecker modeled habitat but may affect individuals. Therefore, based on the impact analysis for the pileated woodpecker and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the pileated woodpecker.

**Mine Site**

Effects to the pileated woodpecker at the mine site under the 2021 MMP would be similar to the white-headed woodpecker analysis, as pileated woodpeckers and modeled habitat are uncommon in the mine site area. There are some documented occurrences in the Big Creek and Chamberlain areas, and it is possible they may utilize the wildlife analysis area. There would be no direct impacts to pileated woodpecker modeled habitat on the mine site under the 2021 MMP. Indirect impacts could include displacement due to noise or light, and design features described for the white-headed woodpecker would likely reduce those impacts.

**Access Roads**

Effects to the pileated woodpecker along the access roads under the 2021 MMP would be similar to the white-headed woodpecker analysis, as pileated woodpeckers and modeled habitat are rare along the access roads. There would be 0.5 acre of direct impacts to modeled habitat along the access roads for the 2021 MMP (Table 4.13-13). Indirect impacts could include displacement due to noise, light, or fugitive dust and design features described for the white-headed woodpecker would likely reduce those impacts.

**Utilities**

Effects to the pileated woodpecker associated with the utilities under the 2021 MMP would be similar to the white-headed woodpecker analysis, as pileated woodpeckers and modeled habitat are rare in the utility areas. There would be 0.5 acres of direct impacts to pileated woodpecker modeled habitat along the utilities under the 2021 MMP. Indirect impacts could include displacement due to noise or light, and design features described for the white-headed woodpecker would likely reduce those impacts.

**Off-site Facilities**

Effects to the pileated woodpecker at the off-site facilities under the 2021 MMP would be similar to the white-headed woodpecker analysis, as pileated woodpeckers and habitat are rare near the off-site facilities. There would be no direct impacts to pileated woodpecker modeled habitat for the off-site facilities under the 2021 MMP. Indirect impacts could include displacement due to noise or light, and design features described for the white-headed woodpecker would likely reduce those impacts.

**Silver-haired Bat**

Figure 3.13-19 shows the components of the 2021 MMP and Johnson Creek Route Alternative within the wildlife analysis area compared to modeled habitat (Table 4.13-14).
Table 4.13-14 Silver-haired Bat Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2021 MMP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>44</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>30</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>145</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>219</td>
<td>11,446</td>
</tr>
<tr>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>43</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>87</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>144</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>275</td>
<td>10,773</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile from mine site and 0.5 mile from other components for bats) and occur outside of the SGP components.

The 2021 MMP may directly and indirectly impact silver-haired bat individuals and habitat. Therefore, based on the impact analysis for the silver-haired bat and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the silver-haired bat.

**Mine Site**

Silver-haired bats are documented in the wildlife analysis area and FCRNRW. There would be approximately 44 acres of direct impacts to modeled habitat at the mine site under the 2021 MMP (Table 4.13-14). Removal of large trees could reduce roosting habitat, while removal of open riparian habitats or small natural openings could reduce foraging habitat.

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Silver-haired bat behaviors that may change as a result of increased noise and light include changes in roosting and foraging patterns that could lead to fragmentation of habitat. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Therefore, indirect impacts on silver-haired bats would differ depending on the specific conditions at each individual 2021 MMP component location based on the density of vegetation and proximity to adjoining hillsides and valleys.

**Access Roads**

There would be approximately 30 acres of direct impacts to modeled habitat along the access roads under the 2021 MMP, due to construction of the Burntlog Route (Table 4.13-14). Removal of large trees in this area could reduce roosting habitat. The new segment of the Burntlog Route would be decommissioned and reclaimed during mine closure, which would reduce impacts to silver-haired bats and potentially...
create foraging habitat in the long-term. The operational traffic associated with the workforce, supplies, haulage, and other miscellaneous traffic, including road maintenance on the access roads, could expose individual bats to indirect impacts due to noise, light, and fugitive dust. Bat behaviors that may change as a result of increased noise, light, and fugitive dust include changes in roosting and foraging patterns that could lead to fragmentation of habitat.

Utilities

There would be approximately 145 acres of direct impacts to modeled habitat along the utilities under the 2021 MMP, due to clearing and construction activities for utility corridors, substations, and communication towers (Table 4.13-14). Removal of large trees during construction could reduce roosting habitat. The Forest Service would require that known roost sites and hibernacula be avoided during the roosting period whenever possible (Section 2.4.9). During operations, the utility ROWs would be maintained in a low vegetation growth stage, which could provide summer foraging habitat for silver-haired bats. Upon closure and reclamation, the new transmission line between the mine site and Johnson Creek substation would be removed and reclaimed, which would reduce habitat impacts.

Noise and light disturbance from construction of the utility corridors, substations, and communication towers may temporarily disturb or displace individual bats. Once the construction is complete, it is expected that silver-haired bats would resume use of the area.

Off-site Facilities

There would be no direct impacts to modeled habitat for silver-haired bat at any of the off-site facilities under the 2021 MMP. Indirect impacts would be unlikely as well, due to modeled habitat being limited around these facilities.

Habitat Family 3 – Forest Mosaic

Mountain Quail

Figure 3.13-20 shows the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (Table 4.13-15).

Mine Site

Mountain quail are believed to be rare in the wildlife analysis area, although modeled habitat is abundant and would be impacted. The 2021 MMP could directly disturb 102 acres of modeled habitat in the mine site area. Mountain quail are ground nesters in shrub-dominated riparian areas and could be at risk of direct nest damage associated with the vegetation clearing and ground disturbance. However, the likelihood of mountain quail nesting in the wildlife analysis area is low because suitable shrub-dominated riparian habitat is sparse in the 2021 MMP disturbance footprint, and the nearest observation of the species is approximately 8 miles west of the mine site (Strobilus Environmental 2017).

Implementation of the 2021 MMP would require removal of vegetation from several habitat types during the life of the mine, some of which would be reclaimed during closure and reclamation. The 2021 MMP would permanently impact a variety of wetlands and perennial and non-perennial streams, which could directly reduce habitat for mountain quail depending on specific riparian areas. Although riparian habitats
would be directly disturbed in the short term, portions of the area would be reclaimed in the long term, including impacted wetlands, stream channels, and associated riparian habitat (Forest Service 2022h).

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Mountain quail behaviors that may change as a result of increased noise and light include modifications in nesting (loss of a nest equals “take”) and/or foraging patterns that could lead to fragmentation of habitat. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Indirect impacts during the brood-rearing season due to loss of insects from emissions and fugitive dust is discussed in the Dusky Grouse section.

### Table 4.13-15 Mountain Quail Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 MMP</td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>102</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>69</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>233</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>405</strong></td>
<td><strong>23,491</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>101</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>115</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>232</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>449</strong></td>
<td><strong>21,337</strong></td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for mountain quail) and occur outside of the SGP components.

The 2021 MMP may directly and indirectly impact mountain quail individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Based on the impact analysis for the mountain quail and its habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to the mountain quail.

### Access Roads

The 2021 MMP could directly disturb 69 acres (Table 4.13-15) of modeled habitat along the access roads. The 2021 MMP would also impact a variety of wetlands and perennial and non-perennial streams (Forest Service 2022h) along access roads, which could directly reduce habitat for mountain quail depending on riparian areas. The operational traffic associated with the workforce, supplies, haulage, and other miscellaneous traffic, including road maintenance on the access roads, could expose individual mountain quail to vehicle-wildlife collisions. The new segment of the Burntlog Route would be decommissioned and reclaimed during mine closure, but the effects would be considered long-term.
Noise, light, and fugitive dust disturbance from road construction, road maintenance, and routine vehicle traffic could potentially disturb or displace individual quail. Mountain quail behaviors that may change as a result of increased noise, light, and fugitive dust include modifications in nesting (loss of a nest equals “take”) and/or foraging patterns that could lead to fragmentation of habitat. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross modeled habitat, which may disrupt mountain quail due to OSV noise. See the Dusky Grouse section for indirect impacts related to fugitive dust along access roads that could also impact mountain quail.

Utilities
The 2021 MMP could directly disturb 233 acres (Table 4.13-15) of modeled habitat due to clearing and construction activities for utility corridors, substations, and communication towers. Utility components under the 2021 MMP would impact a variety of wetlands and perennial and non-perennial streams (Forest Service 2022h). Direct impacts to forested wetlands would likely be permanent as ROW management practices generally do not allow the establishment of woody vegetation. Utility corridors would be maintained in a low vegetation stage during operations, which could disturb modeled habitat as well.

Noise and light disturbance from construction of the utility corridors, substations, and communication towers may temporarily disturb or displace individuals. These indirect impacts would be considered temporary during construction. Once the construction is complete, it is expected that mountain quail would resume use of the area.

Off-site Facilities
The 2021 MMP would directly disturb 1 acre of modeled habitat for the off-site facilities and up to 1 acre of wetlands and associated riparian habitat would be impacted. However, it is expected that most individuals would avoid these areas, and any habitat effects would be minor.

Indirect impacts would be unlikely as modeled habitat is limited near these facilities. However, noise-reduction strategies would be used to reduce any potential indirect impacts on mountain quail. Buildings would have limited external lighting and would employ noise-minimizing practices.

Habitat Family 5 – Forest and Range Mosaic

Gray Wolf

The 2021 MMP may directly and indirectly impact gray wolf individuals and habitat (i.e., general habitat types), but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the gray wolf and its habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to the gray wolf.

Mine Site

Direct impacts on gray wolves would include habitat loss in the wildlife analysis area. Additional indirect impacts on gray wolves would include displacement due to noise and light or increased human activity. These same effects also could reduce prey availability or redistribute their populations in the wildlife analysis area, causing wolves to travel farther for foraging opportunities. This could expose them to
increased competition with other wolf packs as they seek new territory and would be a potential indirect effect.

**Access Roads**

Several wolf packs occur in the FCRNRW area, which is near the Burntlog Route. Direct impacts on gray wolves would include habitat loss and an increased potential of vehicle-wildlife collisions along the Burntlog Route. Vehicle traffic associated with the access roads could increase the risk of wildlife-vehicle collisions. All employees and contractors would be trained to reduce wildlife collisions. Perpetua would develop a wildlife mortality-reporting procedure and form to be used for reporting accidental 2021 MMP-related wildlife mortality. Any adverse wildlife encounters would be reported to appropriate state and federal wildlife managers, and in accordance with state and federal laws. Restricting public access on the Burntlog Route would likely reduce impacts due to mortality.

Indirect impacts would include displacement due to noise and light or increased human activity. The new road systems and groomed OSV trails could serve as hunting corridors for wolves, changing their movement patterns and indirectly increasing predation of big game species, including elk (Forest Service 2017b). Although additional roadways could expose gray wolves to hunting pressure from humans in the wildlife analysis area, hunting or discharge of firearms during construction and operations in the Operations Area Boundary by SGP employees and contractors would be prohibited. Signs would be posted throughout the mine site and off-site facilities and training would be provided to notify employees that hunting is prohibited, and employees would be prohibited from carrying firearms on any SGP site. Although design features would reduce impacts, there would still be a direct decrease in habitat, and increase in risk of disturbance and injury or mortality. These same effects also could reduce prey availability in the SGP area, causing wolves to range farther. This indirect effect also could expose them to increased competition with other wolf packs as they seek new territory.

**Utilities**

Direct impacts on gray wolves would include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes. Construction impacts would likely displace wolves farther distances but would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable.

**Off-site Facilities**

Direct impacts on gray wolves would include habitat loss in the wildlife analysis area and could include displacement due to noise and light or increased human activity. These same effects also could reduce prey availability in the SGP area, which would indirectly affect the gray wolf.

**Peregrine Falcon**

The focal species selected for the WCS for the BNF and PNF represent the appropriate habitat types and are surrogates for many other species, including peregrine falcon. Thus, there are no specific habitat models available for this species.
The 2021 MMP may directly and indirectly impact peregrine falcon individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the peregrine falcon and its habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to the peregrine falcon.

**Mine Site**

Direct impacts on peregrine falcon would include potential habitat loss in the wildlife analysis area. Indirect impacts would include displacement due to noise and light and increased human activity. These same effects also could reduce avian prey availability or redistribute their populations in the wildlife analysis area, which could indirectly impact falcons.

**Access Roads**

Direct impacts on peregrine falcon would include habitat loss within and adjacent to breeding territories that are known to occur in the FCRNRW area. Indirect impacts would include displacement due to noise and light from increased human activity and traffic.

**Utilities**

Direct impacts on peregrine falcons would include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes. Construction impacts would likely displace falcons farther distances but would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable.

**Off-site Facilities**

Direct impacts on peregrine falcons would include habitat loss in the wildlife analysis area and could include displacement due to noise and light or increased human activity.

**Rocky Mountain Bighorn Sheep**

Figures 3.13-5 and 3.13-6 show the components of the 2021 MMP within the wildlife analysis area compared to modeled habitat (Table 4.13-16).

**Habitat Impacts**

**Table 4.13-16 Rocky Mountain Bighorn Sheep Direct and Indirect Impacts**

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres) - Summer</th>
<th>Indirectly Impacted Modeled Habitat (acres) - Summer</th>
<th>Directly Impacted Modeled Habitat (acres) - Winter</th>
<th>Indirectly Impacted Modeled Habitat (acres) - Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site</td>
<td>501</td>
<td>N/A</td>
<td>104</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>62</td>
<td>N/A</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>73</td>
<td>N/A</td>
<td>23</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Project Component</td>
<td>Directly Impacted Modeled Habitat (acres) - Summer</td>
<td>Indirectly Impacted Modeled Habitat (acres) - Summer</td>
<td>Directly Impacted Modeled Habitat (acres) - Winter</td>
<td>Indirectly Impacted Modeled Habitat (acres) - Winter</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>636</td>
<td>12,673</td>
<td>137</td>
<td>2,755</td>
</tr>
<tr>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td><strong>Total</strong></td>
<td><strong>629</strong></td>
<td><strong>10,842</strong></td>
<td><strong>149</strong></td>
</tr>
<tr>
<td>Mine Site</td>
<td>500</td>
<td>N/A</td>
<td>104</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>57</td>
<td>N/A</td>
<td>22</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>72</td>
<td>N/A</td>
<td>23</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>629</td>
<td>10,842</td>
<td>149</td>
<td>2,668</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (1.0 mile for bighorn sheep and occur outside of the SGP components.

The 2021 MMP may directly and indirectly impact Rocky Mountain bighorn sheep individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. However, due to their value as a big game species in Idaho, impacts may include potential changes in abundance and distribution of bighorn sheep, and therefore impacts to bighorn sheep hunting opportunities in the surrounding region. More summer habitat would be directly and indirectly impacted than winter habitat. Therefore, based on the impact analysis for the bighorn sheep and its habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, moderate impacts to the bighorn sheep.

**Mine Site**

There is more Rocky Mountain bighorn sheep summer habitat in the vicinity of the mine site than winter habitat. As such, there would be approximately 501 acres of direct impacts to summer modeled habitat and 104 acres of winter modeled habitat under the 2021 MMP at the mine site (Table 4.13-16). This direct loss of habitat would displace any individuals that occur in the wildlife analysis area, which appears to be limited. The mine site and associated infrastructure may displace sheep around the perimeter of the disturbances. Rocky Mountain bighorn sheep are very mobile and able to avoid localized direct threat of injury or mortality. Although additional roadways near the mine site could expose individuals to direct vehicle collisions and associated mortality. Personnel and contractors traveling in vehicles would be required to observe posted speed limits or state secondary road speed limits, and to drive at speeds appropriate to reduce the possibility of vehicle-wildlife accidents.

Light and noise impacts are reduced by vegetation, topography, and distance from the impact sources. Therefore, indirect impacts on sheep would differ depending on the specific conditions at each 2021 MMP component location, based on the density of vegetation and proximity to adjoining hillsides and valleys. As part of SGP design features, buildings, equipment, and drill rigs would have limited external lighting and use noise-reduction strategies when feasible (Section 2.4.9). The result would generally be a reduction in the area of habitat disturbed at most sites.

There would be no hunting or discharge of firearms during construction and operations in the Operations Area Boundary by SGP employees and contractors. Signs would be posted at the SGP area and training...
would be provided to notify employees that hunting is prohibited, and employees would be prohibited from carrying firearms on the SGP site. However, illegal harvest of big game species is a potential risk and would be an indirect impact.

Access Roads

Because bighorn sheep are known to occur in the FCRNRW area, they could potentially be affected by loss of potential habitat along the access roads, and direct impacts would include approximately 62 acres of modeled summer habitat and 10 acres of modeled winter habitat. The new 15-mile-long section of Burntlog Route would be constructed and plowed year-round and have an AADT level of 50 vehicles during operations, which would likely directly disrupt or alter Rocky Mountain bighorn sheep movements. The intensity of this impact could range from minor injury to mortality. The duration ranges from temporary road construction to short-term. It is not expected that the increased risk of injury or mortality would become permanent, because the new segment of the Burntlog Route would be reclaimed upon closure, and traffic levels on the existing roads would return to current levels. The geographic extent of these impacts would be limited to the vicinity of the access road. Additionally, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) would cross Rocky Mountain bighorn sheep winter habitat, which may disrupt them due to OSV noise.

Although additional roadways could expose Rocky Mountain bighorn sheep to increased illegal hunting pressure from humans in the wildlife analysis area, legal hunting is extremely limited in this area of Idaho and IDFG carefully manages Rocky Mountain bighorn sheep populations and regulates the relatively low number of permits issued each year; therefore, additional hunter access is unlikely to appreciably increase hunting pressure on Rocky Mountain bighorn sheep in the SGP area. Additionally, hunting or discharge of firearms during construction and operations in the Operations Area Boundary would be prohibited for SGP employees and contractors. Signs would be posted throughout the SGP area and training would be provided to notify employees that hunting is prohibited, and employees would be prohibited from carrying firearms on the SGP site. Legal public hunting along public access roads would continue to be allowed. Roadways also are used as corridors by predators such as wolves or mountain lions, which could indirectly increase predation on Rocky Mountain bighorn sheep.

Utilities

Direct impacts on Rocky Mountain bighorn sheep could include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes. There would be 73 acres of direct impacts to modeled summer habitat and 23 acres of direct impacts to modeled winter habitat under the 2021 MMP for the utility corridors (Table 4.13-16). Construction impacts would likely displace wildlife farther distances, but this would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable.

Noise-reduction strategies would be used to reduce indirect effects on sheep. Equipment would have limited external lighting and would employ noise-minimizing practices.
Off-site Facilities
There would be no direct impacts to modeled summer or winter habitat due to construction and operation of the off-site facilities under the 2021 MMP. Indirect impacts would also be unlikely, as modeled habitat is limited within 1 mile of these facilities.

Habitat Family 7 – Forests, Woodland, and Sagebrush

Townsend’s Big-eared Bat

The focal species selected for the WCS for the BNF and PNF represent the appropriate habitat types and are surrogates for many other species, including Townsend’s big-eared bat. Thus, there are no specific habitat models available for this species.

The 2021 MMP may directly and indirectly impact Townsend’s big-eared bat individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the Townsend’s big-eared bat and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the Townsend’s big-eared bat.

Mine Site
Direct disturbance to the Townsend’s big-eared bat would be possible through habitat loss at the mine site. Although some historic mine workings that may serve as winter hibernacula habitat are present in the wildlife analysis area, there are no known occurrences of the Townsend’s big-eared bat. After closure and reclamation, the pit walls of the Hangar Flats and West End pits would be exposed for a long time period, which could potentially create roost sites for them. The Forest Service would require that any potential drill pad sites adjacent to any open mine workings or natural caves should be observed for the presence of bats. If necessary, to maintain key features of habitat or to avoid disruption, activities would be modified in coordination with the Forest Service (Section 2.4.9).

The 2021 MMP also would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Bat behaviors that may change as a result of increased noise or light include changes in roosting or foraging patterns that could lead to fragmentation of habitat. The potential effects on wildlife habitat are dependent on geographical conditions because sound propagation is reduced by distance, vegetation, and intervening topography. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Refer to the silver-haired bat section, which discusses additional indirect impacts that could likely also impact the Townsend’s big-eared bat, including emissions exposure and loss of insects due to air emissions and fugitive dust.

Access Roads Utilities
Disturbance to the Townsend’s big-eared bat would be possible due to habitat loss along the access roads, but unlikely because of their limited occurrence in the area. Because they can occupy forested habitats within 15 miles of cave/rock crevices, they could potentially be displaced by the removal of summer roosting habitat.
Disturbance to the Townsend’s big-eared bat due to road construction and vehicle traffic along the Burntlog Route also would be possible. Potential effects could include direct disturbance and displacement, although signal masking due to traffic noise is unlikely, because traffic noise does not overlap much with bat echolocation calls (Caltrans 2016). The noise-reduction strategies mentioned above employed along access roads would likely be sufficient to reduce noise impacts on the Townsend’s big-eared bat. Refer to the silver-haired bat section, which contains additional indirect impacts that would likely also impact the Townsend’s big-eared bat.

Utilities

Direct impacts on the Townsend’s big-eared bat could include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes. Construction impacts would likely displace wildlife farther distances but would be temporary. Vegetation would be cleared only in those areas necessary for the 2021 MMP activities to preserve natural habitat to the greatest extent practicable.

Noise and light reduction strategies would be used to reduce indirect effects on the Townsend’s big-eared bat. Lighting impacts could alter the Townsend’s big-eared bat’s natural activities, but construction of these areas would be temporary. Refer to the silver-haired bat section, which contains additional indirect impacts that would likely also impact the Townsend’s big-eared bat.

Off-site Facilities

Direct impacts on the Townsend’s big-eared bat are unlikely near the off-site facilities, because no construction or infrastructure would impact the habitats used by the Townsend’s big-eared bat in the wildlife analysis area. Noise and light reduction strategies would be used to reduce indirect effects on the Townsend’s big-eared bat within 1 mile of these facilities. Equipment would have limited external lighting and would employ noise-minimizing practices. Lighting impacts could alter the Townsend’s big-eared bat’s natural activities, but construction of these areas would be temporary. Refer to the silver-haired bat section, which contains additional indirect impacts that would likely also impact the Townsend’s big-eared bat.

Habitat Family 13 – Riverine Riparian and Wetland

Bald Eagle

The focal species selected for the WCS for the BNF and PNF represent the appropriate habitat types and are surrogates for many other species, including bald eagle. Thus, there are no specific habitat models available for this species.

The 2021 MMP may directly and indirectly impact bald eagle individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the bald eagle and its habitat, the 2021 MMP would result primarily in localized, long-term and permanent, minor impacts to the bald eagle.
**Mine Site**

The 2021 MMP could directly disturb bald eagles in the analysis area through habitat loss, disturbance from increased human activity, and helicopter flights. Direct take of adult birds due to construction or operational activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. Trees found to contain nests would not be disturbed or cut. A Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce impacts, there would still be a decrease in habitat.

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. A likely indirect effect is that there would be a reduction in prey species (i.e., fish) within the mine site.

The bald eagle also could be impacted by direct collision risks with structures at the mine site. Transmission line structures to serve 2021 MMP facilities and the new 138-kV transmission line in the mine site would be a potential source of mortality for raptors (APLIC 2012). However, the utility line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species.

**Access Roads**

The 2021 MMP could directly disturb bald eagles in the analysis area through habitat loss due to tree clearing, road construction, and increased human activity along access roads. Direct take of adult birds due to these activities is unlikely, because most individuals are expected to avoid areas of activity. However, there are known eagle nests along Johnson Creek Road and Warm Lake, and it is possible that eagles would be displaced from these territories due to the increased traffic.

Roadkill from 2021 MMP traffic could attract Bald Eagles to roadsides where they also would be exposed to vehicle-wildlife collisions. Perpetua would establish appropriate speed limits (i.e., generally 30 mph or less) for the Burntlog Route, site haul roads, and light vehicle access roads to reduce the possibility of vehicle-wildlife collisions. All staff and contractors would be trained to observe posted speed limits and reduce wildlife collisions. However, wildlife-vehicle collisions are still a possibility. Any adverse wildlife encounters would be reported to appropriate state and federal wildlife managers. Restricting public access on the Burntlog Route and removing roadkill from roadways would likely reduce impacts due to mortality.

Noise-reduction strategies would be used to reduce indirect effects on bald eagles. Although timing restrictions would restrict some activities within a certain radius of active nest trees for raptor species, which would help reduce habitat impacts, some displacement and nest failure could occur. Cutting of trees for 2021 MMP activities would avoid avian tree nests, where feasible, and a Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce direct impacts, there would still be a decrease in habitat.
Utilities
The 2021 MMP could directly disturb bald eagles in the analysis area through habitat loss due to clearing and construction activities for utility corridors, substations, and communication towers. Direct take of adult birds due to these activities is unlikely because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young would be disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. To the extent practicable, trees found to contain nests would not be disturbed or cut. No trees with active nests would be cut.

The cell tower, communication tower, repeater sites, and new 138-kV transmission line would be a potential source of mortality for bald eagles (APLIC 2012). The utility line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Electric transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (to minimize the risk of being electrocuted). However, the long-term presence of structures and communication towers would pose a risk of collision and direct mortality.

Off-site Facilities
The 2021 MMP is unlikely to directly disturb bald eagles in the analysis area through habitat loss due to clearing and construction activities for off-site facilities.

The 2021 MMP could disturb individual bald eagles in the wildlife analysis area through noise and light due to construction of the off-site facilities. Noise-reduction strategies would be used to reduce indirect effects on bald eagles. Lighting BMPs would be used to reduce indirect effects on sensitive wildlife species. Buildings would have limited external lighting and would employ noise-minimizing practices.

Columbia Spotted Frog

Figure 3.13-7 shows the components of the 2021 MMP within the analysis area compared to the riparian analysis area (Table 4.13-17).

The focal species selected for the WCS for the BNF and PNF represent the appropriate habitat types and are surrogates for many other species, including Columbia spotted frog. Thus, there are no specific habitat models available for this species. However, the riparian analysis area has been used for estimating impacts to this amphibian. Indirect impacts are assessed by including any forested wetlands or riparian areas within 0.5 mile of SGP components.

The 2021 MMP may directly and indirectly impact Columbia spotted frog individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the Columbia spotted frog and its habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to the Columbia spotted frog.
Table 4.13-17 Columbia Spotted Frog Direct and Indirect Impacts

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Directly Impacted Modeled Habitat (acres)</th>
<th>Indirectly Impacted Modeled Habitat (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2021 MMP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>621</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>120</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>302</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,049</strong></td>
<td><strong>19,294</strong></td>
</tr>
<tr>
<td><strong>Johnson Creek Route Alternative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine Site</td>
<td>618</td>
<td>N/A</td>
</tr>
<tr>
<td>Access Roads</td>
<td>126</td>
<td>N/A</td>
</tr>
<tr>
<td>Utilities</td>
<td>301</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-site Facilities</td>
<td>8</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,053</strong></td>
<td><strong>15,948</strong></td>
</tr>
</tbody>
</table>

Source: Forest Service 2020e.
N/A = indirect impacts are calculated by buffer distances (0.5 mile for Columbia spotted frog) and occur outside of the SGP components.

Mine Site

Amphibians are considered reliable indicators of environmental quality (Boyer and Grue 1995). Water quality criteria for frogs and other amphibians do not currently exist. Rather, the following discussion summarizes impacts on fish resources from chemical contaminants associated with SGP (Section 4.12), as fish have historically been used as surrogates for amphibians in evaluating chemical impacts in aquatic environments (Glaberman et al. 2019).

Despite analysis area improvements to water quality as a result of the removal and reclamation of legacy mine wastes, exceedances of the most stringent water quality standards (including both human health and aquatic life) for water column antimony, arsenic, copper, and mercury are anticipated to extend indefinitely throughout SGP post-closure. In considering only the aquatic life criteria, which are more relevant for the protection of fish species, impacts due to antimony and arsenic are not anticipated. For copper and mercury, impacts may be minimal but uncertainties in predicting future conditions exist. For copper, the Biotic Ligand Model-based criteria are preliminary and do not encompass the range of monitoring nodes and the range of variability required for Biotic Ligand Model implementation (Brown and Caldwell 2020c). For mercury, while the predicted concentrations do not exceed the aquatic life criterion based on water column, it is uncertain whether incremental change in water column concentrations beyond baseline would cause fish tissue concentrations to exceed the tissue-based criterion.

A Water Management Plan has been developed (Brown and Caldwell 2021b) and the Water Quality section (Section 4.9) provides more details regarding changes to water quality. The Fisheries and Aquatic Habitat section (Section 4.12) provides an analysis of changes and summary of effects on fish under the 2021 MMP.
The 2021 MMP could directly disturb Columbia spotted frog in the riparian analysis area through permanent impacts to wetlands in the mine site area. Up to 621 acres of direct impacts to this habitat would occur in the mine site (Table 4.13-17). Columbia spotted frogs have been observed in the riparian analysis area near the operational areas and open pits along the East Fork SFSR, and their presence is also likely based on habitat (i.e., streams and wetlands). Disturbance of water sources would occur in areas occupied by spotted frogs, placing them at risk of direct mortality or displacement. The presence of traffic in the mine site could expose them to direct mortality from vehicles as well.

The Forest Service would require that potential water sources be surveyed for Columbia spotted frog egg masses and other amphibians after ice melt, and the 2021 MMP would avoid disturbing any water sources with identified egg masses or other species, with some exceptions (Section 2.4.9). Construction of a natural stream channel for the East Fork SFSR and reclaimed stream channels, wetlands, and riparian habitat (Forest Service 2022h) upon closure would reclaim some riparian habitat for Columbia spotted frogs in the future.

The 2021 MMP would cause an increase in noise and light in the riparian analysis area, mostly in the vicinity of the mine site. Columbia spotted frogs could be impacted by an interference in communication during breeding activities. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Additionally, light and noise impacts could be reduced by vegetation, topography, and distance from the impact sources. Therefore, indirect impacts on wildlife would differ depending on the specific conditions at each individual 2021 MMP component location based on the density of vegetation and proximity to adjoining hillsides and valleys.

Another indirect effect for Columbia spotted frog could occur in wetlands affected by fugitive dust and emissions.

Amphibians and insects may be exposed to metals (e.g., mercury) and other elements from atmospheric emissions and tailings piles associated with gold and silver mining activities (Custer et al. 2009; Eagles-Smith et al. 2018; Jones and Miller 2005). Emissions of metals from mine operations and ore processing, in the form of particulate matter and dust, may be deposited directly on local soils and waterways. In addition, rainwater and snow melt may provide a pathway for these elements to leach from tailings piles or be physically transported as solid particles into adjacent waterbodies. These elements may enter the food web through plants and insects and then be consumed by insectivorous wildlife, potentially causing injury if exposure is sufficient, therefore, there would likely be indirect impacts to amphibians like the Columbia spotted frog.

**Access Roads**

The 2021 MMP could directly disturb Columbia spotted frog in the riparian analysis area through impacts to wetlands along the access roads, and up to 120 acres of modeled habitat could be impacted along the Burntlog Route. Road construction, culvert installation, disturbance of roadside ditches that contain enough water for egg laying, and increased traffic levels may cause direct mortality. Restricting public access on the Burntlog Route would likely reduce impacts due to mortality. Anurans (including Columbia spotted frogs) are very susceptible to mortality from roadways (Jochimsen et al. 2004) when they cross them or emerge from their eggs in the spring. The new segment of the Burntlog Route would be
decommissioned and reclaimed during mine closure, but the effects would mostly still be considered permanent due to the long time-period. As described for the mine site, potential water sources would be surveyed for Columbia spotted frog egg masses and other amphibians after ice melt, and the 2021 MMP would avoid disturbing any water sources with identified egg masses or other species.

The 2021 MMP would cause an increase in noise and light in the riparian analysis area, which could directly affect frogs along the access roads. These indirect impacts are described in the mine site section. Another indirect impact to amphibians along access roads could include fugitive dust. Dust associated with construction of facilities and roads, road maintenance, and vehicle travel may have indirect impacts on insects. Increased dust deposition could result in negative impacts to pollinating insects. For SGP, the potential for dust deposition is likely to be higher in the immediate area of roads and other surface-disturbing actions but would diminish with distance from these actions. Dust impacts on insects would start during construction and continue through closure and reclamation. Some dust deposition also may occur in the post-closure period where monitoring-related travel on dirt roads would occur; however, this would be negligible. Effects of dust on insects would occur immediately at the time of dust propagating activities and is likely to continue throughout the lifetime of SGP.

Utilities

The 2021 MMP could directly disturb Columbia spotted frogs in the riparian analysis area through impacts to wetlands due to clearing and construction activities for utility corridors, substations, and communication towers. Direct impacts to modeled habitat are estimated to be 302 acres under the 2021 MMP. The effects on wetlands would be considered temporary during construction. However, impacts to forested wetlands would likely be permanent as ROW management practices generally do not allow the establishment of woody vegetation. Construction activities associated with the utilities may cause direct mortality for some frogs.

Potential water sources would be surveyed for Columbia spotted frog egg masses and other amphibians after ice melt, and the 2021 MMP would avoid disturbing any water sources with identified egg masses or other species. The 2021 MMP would cause an increase in noise and light in the riparian analysis area, which could directly affect frogs in the utilities. These indirect impacts are described in the mine site section.

Off-site Facilities

The 2021 MMP would impact 6 acres of modeled habitat for construction of the off-site facilities (Table 4.13-17). It is possible that individual frogs could be directly or indirectly impacted from these activities. The operating procedures and design features would be used to reduce impacts where possible.

Idaho Species of Greatest Conservation Concern

Direct impacts on SGCN could include direct mortality (i.e., wildlife-vehicle collisions, removal of nest or roost trees, etc.) or loss of habitat due to land clearing activities and land use changes. Indirect impacts could include reduced use of foraging or breeding habitat or reduced prey resources in the analysis areas. The 2021 MMP may directly and indirectly impact SGCN (including general habitat, riparian, and alpine species) individuals and habitat. Therefore, based on the impact analysis for SGCN and their habitat, the
2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to SGCN.

**General Habitat Species**

**Mine Site**

Direct effects on general habitat SGCN would primarily be due to loss and fragmentation of habitat, and disturbance from light, noise, and increased human activity. There would be a direct loss of habitat in the wildlife analysis area at the mine site under the 2021 MMP. Displaced individuals would likely only be lost to the population if the adjacent environment were at maximum carrying capacity, to the extent that there were not enough available habitats to support them. In such a case, individuals would have to travel farther, exposing them to predation risks and energetic loss.

Light and noise impacts associated with mine site activities are likely to disturb or displace these SGCN. Bird and bat behaviors that may change as a result of increased noise or light including changes in roosting or foraging patterns that could lead to fragmentation of habitat. The estimated total average hourly noise levels from the mine site during the operations phase would be 102 dBA with blasting, which would extend out to 2.2 miles before attenuating to the threshold of 55 dBA (Forest Service 2022d). However, under the blasting scenario, SGP-related noise levels from the mine site during operations would attenuate to well below average ambient sound levels, because the impacts are reduced by vegetation, topography, and distance from the impact sources. Noise-reduction would be used and could reduce indirect effects on wildlife. Equipment would have limited external lighting and would employ noise-minimizing practices. The result would generally be a reduction in the area of habitat disturbed at most sites, but there would be indirect effects regardless. Timing restrictions would restrict some activities (e.g., blasting, drilling, etc.) within 1 mile of active winter hibernacula and summary maternity sites, which would help reduce habitat impacts.

**Access Roads**

Direct effects on general habitat for SGCN would primarily be due to loss and fragmentation of habitat, and disturbance from light, noise, fugitive dust, and increased human activity under the 2021 MMP. Construction of 15 miles of new road for the Burntlog Route would likely fragment habitat for SGCN and may act as a barrier to movement for some species. The new 15-mile-long section of Burntlog Route would be constructed and plowed year-round and have an AADT level of 50 during operations, which could disturb the bird and bat SGCN. The intensity of this impact could range from minor displacement to mortality. The duration ranges from temporary road construction to short-term. It is not expected that the increased risk of injury or mortality would become permanent, because the new segment of the Burntlog Route would be reclaimed upon closure, and traffic levels on the existing roads would return to current levels. The geographic extent of these impacts would be limited to the vicinity of the access road. Restricting public access on the Burntlog Route would likely reduce impacts due to mortality.

Light, noise, and fugitive dust impacts associated with road construction, maintenance, and vehicle traffic are likely to disturb or displace these birds and bats. SGP design features would help reduce these impacts, but not eliminate them. The estimated noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA. The estimated SGP-related noise level from road
maintenance activity on the mine access road would range from 88 dBA during the summer months to 90 dBA during the winter months, when snow removal is required (Forest Service 2022d).

**Utilities**

Direct impacts on general habitat for SGCN could include loss or fragmentation of habitat along utility corridors, or at substations and communication towers due to land clearing activities and land use changes under the 2021 MMP. The addition of new utility access roads, as well as new transmission lines and upgraded transmission lines, could impact individual SGCN. Construction impacts would likely displace wildlife, but effects would be temporary. Vegetation would be cleared only in those areas necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable. During operations, it is likely that wildlife would use the utility corridors again.

Noise and light reduction strategies would be used to reduce indirect effects on bird and bat SGCN. Equipment would have limited external lighting and would employ noise-minimizing practices.

**Off-site Facilities**

Direct impacts on general habitat for SGCN due to the off-site facilities would include loss or fragmentation of habitat. Construction and operation of the off-site facilities of the 2021 MMP are unlikely to disturb most species, because construction activities are not planned to occur in suitable habitat used by them. Noise and lighting reduction strategies would be used to reduce indirect effects on them. Buildings would have limited external lighting and would employ noise-minimizing practices.

**Riparian species**

**Mine Site**

Direct effects on riparian SGCN would primarily be due to permanent impacts to wetlands in the Operations Area Boundary. Under the 2021 MMP, and approximately 621 acres of direct impacts would occur (Table 4.13-17). Construction of a natural stream channel for the East Fork SFSR and reclaimed stream channels, wetlands, and riparian habitat (Forest Service 2022h) upon closure would reclaim some riparian habitat for these species in the future, but the effects would be long-term in these cases.

Implementation of the 2021 MMP would cause an increase in noise and light in the riparian wildlife analysis area, mostly in the vicinity of the mine site. Bird behaviors that may change as a result of increased noise and light include changes in nesting (loss of a nest equals “take”) and/or foraging patterns that could lead to fragmentation of habitat. The noise and light increase may affect western toad breeding activities in the mine site. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices. Therefore, indirect impacts on wildlife would differ depending on the specific conditions at each individual 2021 MMP component location, based on the density of vegetation and proximity to adjoining hillsides and valleys.
**Access Roads**

The 2021 MMP could directly disturb these riparian SGCN in the riparian analysis area through impacts to wetlands (Table 4.13-17). Road construction, culvert installation, disturbance of roadside ditches that contain enough water for egg laying, and increased traffic levels may cause direct mortality to the western toad. Anurans (including western toads) are very susceptible to mortality from roadways (Jochimsen et al. 2004) when they cross them or emerge from their eggs in the spring. The Forest Service would require that potential water sources be surveyed for amphibian egg masses after ice melt, and the 2021 MMP would avoid disturbing any water sources with identified egg masses or other species (Section 2.4.9). The grebes and sandhill crane would likely be impacted from loss of riparian habitat throughout the life of the mine.

Noise, light, and fugitive dust disturbance from road construction, road maintenance, and routine vehicle traffic are likely to disturb or displace individual birds or toads that do occur in the access road vicinity. Western toads could be impacted by an interference in communication during breeding activities. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting and would employ noise-minimizing practices.

**Utilities**

The 2021 MMP could directly disturb riparian SGCN in the riparian analysis area through direct impacts to wetlands (Table 4.13-17) due to clearing and construction activities for utility corridors, substations, and communication towers. Some effects would be considered temporary during. However, impacts to forested wetlands would likely be permanent as ROW management practices generally do not allow the establishment of woody vegetation. Construction activities associated with the utilities may cause direct mortality for some western toads, but likely not for the bird species. Potential water sources would be surveyed for amphibian egg masses, as described for the access roads. During operations, it’s likely that wildlife would use the utility corridors again.

Noise and light disturbance from construction of the utility corridors, substations, and communication towers may temporarily disturb or displace grebes or cranes that use the area. Western toads could be impacted by an interference in communication during breeding activities. Noise-reduction strategies would be used to reduce indirect effects on sensitive wildlife species. Buildings, equipment, and drill rigs would have limited external lighting and would employ noise-minimizing practices.

**Off-site Facilities**

The 2021 MMP would impact 6 acres of modeled habitat (Table 4.13-17) for the off-site facilities, although it is unlikely to directly disturb riparian SGCN in the riparian analysis area, with the possible exception of western toads that may use the affected wetland area.
Alpine Species

Mine Site

Direct impacts on the hoary marmot are possible in the mine site due to habitat loss and associated habitat fragmentation, year-round vehicle traffic causing disturbance and potential avoidance behavior, and a potential risk of vehicle collisions causing injury or mortality under the 2021 MMP. Impacts to persistent snow cover (i.e., wolverine analysis area) are used as a surrogate for marmot habitat. Direct take of these species due to construction or operational activities is possible, but unlikely, because hoary marmots prefer higher elevation meadows or rocky talus slopes where construction activities are unlikely to occur.

The 2021 MMP would cause an increase in noise and light in the wolverine analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include foraging or denning changes. Noise-reduction strategies would be used to reduce indirect effects on this species. Buildings, equipment, and drill rigs would have limited external lighting, and would employ noise-minimizing practices.

Access Roads

There would be a direct habitat loss along the access roads for the hoary marmot under the 2021 MMP. Direct mortality due to construction or operational activities is possible, but unlikely, because hoary marmots are expected to avoid areas of activity.

The 2021 MMP would cause an increase in noise, light, and fugitive dust in the analysis area, due to road construction, vehicle traffic, and maintenance. Noise, light, and fugitive dust design features described for the mine site would likely reduce impacts.

Utilities

There would be a direct habitat loss within the utilities for the hoary marmot under the 2021 MMP. Direct mortality due to construction or operational activities is possible, but unlikely, because the hoary marmot is expected to avoid areas of activity.

The 2021 MMP would cause an increase in noise and light in the analysis area, due to construction, operation, and maintenance of the utilities. Noise and light design features described for the mine site would likely reduce impacts.

Off-site Facilities

The 2021 MMP is unlikely to disturb hoary marmots due to clearing and construction activities for off-site facilities, because a small amount of persistent snow cover years 1 through 7 are expected to be impacted for these facilities. However, indirect effects on them could include reduced use of nearby foraging or denning habitat.
**General Wildlife Species**

Direct impacts on general wildlife species could include direct mortality (i.e., wildlife-vehicle collisions, removal of nest or roost trees, etc.) or loss of habitat due to land clearing activities and land use changes. Indirect impacts could include reduced use of foraging or breeding habitat or reduced prey resources in the analysis area.

The 2021 MMP may directly and indirectly impact general wildlife species individuals and habitat. Therefore, based on the impact analysis for general wildlife species and their habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to general wildlife species.

**Mine Site**

Direct effects on general wildlife species would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, and increased human activity under the 2021 MMP. Displaced individuals would likely only be lost to the population if the adjacent environment were at maximum carrying capacity, to the extent that there were not enough available habitats to support them. In such a case, individuals would have to travel farther, exposing them to predation, vehicle-wildlife collisions, and energetic loss.

General wildlife would likely be displaced around the perimeter of the mine site. Additional roadways in the mine site would expose individuals to direct vehicle collisions or increased hunting pressure from humans in the wildlife analysis area. There would be no hunting or discharge of firearms during construction and operations in the Operations Area Boundary by SGP employees and contractors. Signs would be posted at the SGP area and training would be provided to notify employees that hunting is prohibited, and employees would be prohibited from carrying firearms on the SGP site. Legal public hunting along public access roads would continue to be allowed. However, illegal harvest of some species is a potential risk. Employees and contractors traveling in vehicles would be encouraged to observe posted speed limits or state secondary road speed limits, and to drive at speeds appropriate to reduce the possibility of vehicle-wildlife accidents.

Light and noise impacts associated with mine site activities are likely to disturb or displace common wildlife species. The estimated total average hourly noise levels from the mine site during the operations phase would be 102 dBA with blasting, which would extend out to 2.2 miles before attenuating to the threshold of 55 dBA (Forest Service 2022d). However, under the blasting scenario, SGP-related noise levels from the mine site during operations would attenuate to well below average ambient sound levels, because the impacts are reduced by vegetation, topography, and distance from the impact sources. Noise-reduction strategies would be used to reduce indirect effects on wildlife. Several terrestrial wildlife species have shown responses to anthropogenic noise levels beginning at 40 dBA (Shannon et al. 2016). However, because the existing (ambient) sound levels vary between 20 and 40 dBA, it is likely that SGP area wildlife would have a higher tolerance for noise. Equipment would have limited external lighting and would employ noise-minimizing practices. As part of the SGP, buildings, equipment, and drill rigs would have limited external lighting when feasible. The result would generally be a reduction in the area of habitat disturbed at most sites.
Hazardous materials and chemicals would be transported to the Operations Area Boundary in USDOT-certified containers by trained personnel and would be stored in designated areas employing secondary containment measures. A Hazardous Materials Handling and Emergency Response Plan would address procedures for responding to accidental spills or releases of hazardous materials to minimize environmental effects. Used products would be stored on site in approved containers that would be separate from other trash and garbage products. Therefore, there is little chance of wildlife being exposed to hazardous materials.

**Access Roads**

Direct effects on general wildlife species would primarily be due to loss and fragmentation of habitat; direct mortality through vehicle-wildlife collisions; and disturbance from light, noise, and increased human activity under the 2021 MMP. Construction of 15 miles of new road for the Burntlog Route would likely fragment habitat for general wildlife species and may act as a barrier to movement for some species. The new 15-mile-long section of Burntlog Route would be constructed and plowed year-round and have an AADT level of 50 vehicles, which would likely directly disrupt wildlife movements. The intensity of this impact could range from minor displacement to mortality. The duration ranges from temporary road construction to short-term. It is not expected that the increased risk of injury or mortality would become permanent, because the new segment of the Burntlog Route would be reclaimed, and traffic levels on the existing roads would return to current levels. The geographic extent of these impacts would be limited to the vicinity of the access road.

Although additional roadways could expose general wildlife species to increased hunting pressure from humans in the wildlife analysis area, hunting or discharge of firearms during construction and operations within the Operations Area Boundary by SGP employees and contractors would be prohibited. Legal public hunting along public access roads would continue to be allowed. All staff and contractors would be trained to reduce wildlife collisions. Perpetua would develop a wildlife mortality-reporting procedure and form to be used for reporting accidental 2021 MMP-related wildlife mortality. Any adverse wildlife encounters would be reported to appropriate state and federal wildlife managers, and in accordance with state and federal laws. Roadways also are used as corridors by predators such as wolves, which could indirectly increase predation of some general mammal species.

Light, noise, and fugitive dust impacts associated with road construction, maintenance, and vehicle traffic are likely to disturb or displace common wildlife species. SGP design features would help reduce these impacts, but not eliminate them. The estimated noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA. The estimated SGP-related noise level from road maintenance activity on the mine access road would range from 88 dBA during the summer months to 90 dBA during the winter months, when snow removal is required (Forest Service 2022d).

**Utilities**

Direct impacts on general wildlife species could include loss or fragmentation of habitat along utility corridors, substations, and communication towers due to land clearing activities and land use changes under the 2021 MMP. The addition of new utility access roads, as well as new transmission lines, and upgraded transmission lines, could impact individual general wildlife species. Construction impacts would likely displace wildlife but would be temporary. Vegetation would be cleared only in those areas
necessary for 2021 MMP activities to preserve natural habitat to the greatest extent practicable. However, impacts to forested wetlands would likely be permanent as ROW management practices generally do not allow the establishment of woody vegetation.

Noise-reduction strategies would be used to reduce indirect effects. Equipment would have limited external lighting and would employ noise-minimizing practices.

**Off-site Facilities**

Construction and operation of the off-site facilities under the 2021 MMP are unlikely to disturb most general wildlife species, because construction activities are not planned to occur in suitable habitat used by them. Noise and lighting reduction strategies would be used to reduce indirect effects on species in the vicinity. Buildings would have limited external lighting and would employ noise-minimizing practices.

Although construction and operation of the off-site facilities themselves would likely not cause direct mortality to general wildlife species, vehicle traffic associated with the facilities could result in vehicle-wildlife collisions. All staff and contractors would be trained to reduce wildlife collisions.

**Big Game Species**

Potential effects on big game species would be similar to those discussed for general wildlife species. The discussion below focuses on issues specific to big game species.

The 2021 MMP may directly and indirectly impact big game species individuals and habitat. Therefore, based on the impact analysis for big game species and their habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, moderate impacts to big game species.

**Mine Site**

Big game wildlife species are very mobile and generally able to avoid localized direct threat of injury or mortality due to construction. However, big game species would likely be displaced around the perimeter of the mine site disturbances. Additional roadways in the mine site would expose individuals to direct vehicle collisions or increased hunting pressure from humans in the wildlife analysis area.

Although there are no identified wildlife migration corridors between winter and spring ranges, elk are predicted to use the area for calving in the summer, and big game animals likely use the wildlife analysis area to migrate. Elk and deer may be displaced around the perimeter of the mine site and associated infrastructure, which would directly affect high-value seasonal habitat for elk and mule deer. Blum et al. (2015) observed that mule deer tended to avoid disturbed mining areas in Nevada and rerouting around disturbances would increase their energy expenditures during migration, potentially decreasing survival or productivity. However, given the relatively small size of the mine site in context of the region and available habitat, any direct effect on survival or productivity would likely be small.

**Access Roads**

Roadways also are used as corridors by predators such as wolves, which could indirectly increase predation of elk and mule deer. Plowing the Burntlog Route would increase the access into a previously
less accessible area for wolves and coyotes. Likewise, the 10.4-mile groomed OSV trail along the existing Cabin Creek Road (FR 467) may increase access for predators during the winter.

Although there are no officially designated wildlife migration corridors between winter and spring ranges, big game animals likely use the wildlife analysis area to migrate. Roadways under the 2021 MMP may displace elk and mule deer or increase the possibility of vehicle-wildlife collisions. Under the 2021 MMP, the AADT level during operations would be 50.

If fawning/calving activity is encountered during 2021 MMP activities, the activity would cease and/or be modified in coordination with the Forest Service. Although this and other design features would reduce impacts, there would still be a direct decrease in habitat, and increase in risk of disturbance and injury or mortality.

**Utilities**

There are no officially designated wildlife migration corridors between winter and spring ranges, or any elk winter range in the wildlife analysis area. Linear utility components (transmission lines) of the 2021 MMP components that may present a barrier to the movement of wildlife, although big game species would likely still use these corridors.

**Off-Site Facilities**

Although there are no officially designated wildlife migration corridors between winter and spring ranges, big game animals likely use the wildlife analysis area to migrate. The off-site facilities would be unlikely to disrupt or alter big game herd movements, except for displacing them a short distance, which would have a negligible impact.

**Migratory Bird Species and Bald and Golden Eagles**

Direct impacts on migratory bird species and bald and golden eagles could include direct mortality (i.e., collisions with vehicles, structures, removal of nest trees, etc.) or loss of habitat due to land clearing activities and land use changes. Indirect impacts on these species could include reduced use of foraging or nesting habitat; reduced prey resources (insects and pollinators) in the analysis areas; or disturbance from noise, light, and emissions. Effects on migratory birds under the 2021 MMP are similar in nature to the effects discussed for general wildlife. Therefore, this section focuses only on the differences for migratory bird species.

The 2021 MMP may directly and indirectly impact migratory bird species individuals and habitat. Therefore, based on the impact analysis for migratory bird species and their habitat, the 2021 MMP would result primarily in localized, short-term, long-term, and permanent, minor impacts to migratory bird species.

**Mine Site**

Under the 2021 MMP, direct take of adult birds due to construction or operational activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is possible that nests, eggs, and young could be directly disturbed by vegetation removal (including cutting of trees) during construction if it occurs during the nesting season. Impacts to the priority habitats mentioned in
Table 3.13-8 also may directly affect the migratory bird species found in the analysis areas. The PIF Idaho Bird Conservation Plan (Ritter 2000) contains several goals for the various habitats to reduce impacts on migratory bird species. Implementation of the SGP would require removal of vegetation from several habitat types during the life of the mine but would reclaim several habitats during closure. Although both habitats listed in Table 3.13-8 (i.e., dry ponderosa pine and riparian habitats) would be directly disturbed in the short term, portions of the area would be reclaimed in the long term, including impacted wetlands, stream channels, and associated riparian habitat (Forest Service 2022h). These activities would accomplish some of the PIF Idaho Bird Conservation Plan goals. Cutting of trees for 2021 MMP activities and removal of snags would avoid avian tree nests, where feasible; and a Forest Service wildlife biologist would be notified of any occupied sensitive species nests or dens encountered. Although design features would reduce impacts, there would still be a decrease in habitat.

Migratory bird species also could be impacted by direct collision risks with structures at the mine site. Electric transmission line structures to serve 2021 MMP facilities and the new 138-kV transmission line in the mine site area would be a potential source of mortality for migratory bird species and raptors (APLIC 2012). However, the utility line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to these species.

The 2021 MMP would cause an increase in noise and light in the wildlife analysis area, mostly in the vicinity of the mine site. Construction and operations, vehicle traffic, and helicopter use are likely to directly disturb or displace individuals. Wildlife behaviors that may change as a result of increased noise include nesting (loss of a nest equals “take”) and/or foraging changes. Chronic noise can interfere with an animal’s ability to detect important sounds, while intermittent noise is often perceived as a threat, which can lead to a reduction in fitness (Francis and Barber 2013). Increased noise levels can mask some lower-frequency bird calls, interrupting mating processes. Additionally, Kleist et al. (2018) observed that anthropogenic noise could disrupt stress hormone signaling and lead to lower survival rates across several bird species (i.e., ash-throated flycatcher, western bluebird, mountain bluebird), which may be similar to migratory bird species in the SGP area. Over time, noise can change the composition of avian communities in favor of more noise-tolerant species, which reduces the number of species. Birds migrating through may avoid the area during noisy periods instead of stopping over during migration. Permanent physical damage to a bird’s ability to hear can occur from short-duration, loud sounds (exceeding 140 dBA for single blasts or 125 dBA for multiple blasts), or from continuous (greater than 72 hours) noise at levels above 110 dBA (Dooling and Popper 2007). The average hourly noise level during construction at the mine site would be 94 dBA (at 50 feet) and 102 dBA (at 50 feet) with blasting during operations (Forest Service 2022d). As such, the SGP would not be expected to result in permanent hearing loss for birds. Additionally, light and noise impacts are reduced by vegetation, topography, and distance from the impact sources. Therefore, indirect impacts on wildlife would differ depending on the specific conditions at each 2021 MMP component location, based on the density of vegetation and proximity to adjoining hillsides and valleys. Bright lighting can confuse birds into becoming active earlier in the day and staying alert throughout the night. It also can attract night-flying or migrating birds, causing them to alter their natural activities or expose them to accidental collisions with structures.

Possible direct and indirect effects are that there could be emission exposure and a reduction in prey species near the mine site activities, due to insects being affected by emissions or fugitive dust.
Insects and insectivorous birds may be exposed to metals (e.g., mercury) and other elements from atmospheric emissions and tailings piles associated with gold and silver mining activities (Custer et al. 2009; Eagles-Smith et al. 2018; Jones and Miller 2005). Emissions of metals from mine operations and ore processing, in the form of particulate matter and dust, may be deposited directly on local soils and waterways. In addition, rainwater and snow melt may provide a pathway for these elements to leach from tailings piles or be physically transported as solid particles into adjacent waterbodies. These elements may enter the food web through plants and insects and then be consumed by insectivorous wildlife, potentially causing injury if exposure is sufficient, therefore, there would likely be indirect impacts to insectivorous migratory birds.

As part of SGP design features, buildings, equipment, and drill rigs would employ noise-minimizing practices and would have limited external lighting when feasible. The result would generally be a reduction in the area of habitat disturbed at most sites. The noise and light reduction strategies employed in the SGP area would reduce noise impacts on migratory birds, but not eliminate them. Timing restrictions would restrict some activities within a certain radius of active nest trees for avian species, which would help reduce habitat impacts.

Access Road

Migratory bird species, including focal species that are migratory, could be directly impacted and disturbed in the wildlife analysis area through vehicle mortality, habitat loss due to tree clearing, road construction, traffic noise and dust, and increased human activity along access roads. Direct take of adult birds due to these activities is possible, but unlikely, because most individuals are expected to avoid areas of activity. However, it is likely that nests, eggs, and young would be directly disturbed by vegetation removal, including cutting of trees, if it occurs during the nesting season. Ground disturbance associated with road construction and upgrades could cause injury or mortality of ground-nesting birds if conducted during the breeding season. Cutting of trees for 2021 MMP activities would avoid avian tree nests, where feasible, and a Forest Service wildlife biologist would be notified of any occupied sensitive species nests encountered. Although design features would reduce direct impacts, there would still be a decrease in habitat. The Burntlog Route may present a barrier to movement for sensitive migratory bird species.

Additionally, noise, light, and fugitive dust from road construction, road maintenance, and routine vehicle traffic is likely to disturb or displace individual migratory bird species or bald and golden eagles from roadside habitats. Increased ambient noise levels can mask some lower-frequency bird calls, interrupting mating processes. Additionally, Kleist et al. (2018) observed that anthropogenic noise could disrupt stress hormone signaling and lead to lower survival rates across several bird species (i.e., ash-throated flycatcher, western bluebird, mountain bluebird), which may be similar to migratory bird species in the SGP area. McClure et al. (2013) observed that simulated traffic noise led to a decline in bird abundance at sites in southern Idaho by about one quarter, and that many migratory bird species may avoid sites with such noise levels. The average hourly noise level during construction for the access roads would be 91 dBA (at 50 feet) and 86 (winter) to 88 (summer) dBA (at 50 feet) during operations (Forest Service 2022d). As such, the SGP would not be expected to result in permanent hearing loss for birds. Bright lighting can attract night-flying or migrating birds, causing them to alter their natural activities or expose them to accidental collisions with structures.
Noise, light, and fugitive dust reduction strategies described for the mine site and for other general wildlife species would be used to reduce indirect effects on migratory bird species.

Utilities

The 2021 MMP could directly disturb migratory bird species in the wildlife analysis area through habitat loss due to clearing and construction activities for utility corridors, substations, and communication towers. Direct take of adult birds due to these activities is unlikely because most individuals are expected to avoid areas of activity. However, it is likely that nests, eggs, and young would be disturbed by vegetation removal, including cutting of trees if it occurs during the nesting season. To the extent practicable, trees found to contain nests would not be disturbed or cut. No trees with active nests would be cut.

The cell tower, communication tower, repeater sites, and new or upgraded 138-kV transmission line would be a potential source of mortality for migratory bird species and raptors through accidental collisions with structures, cell towers, or transmission lines (APLIC 2012). In the long-term, the utility line design would meet APLIC raptor-protection criteria and include insulating or covered apparatus for perch accommodation to reduce risks to raptor species. Electric transmission line structures to serve 2021 MMP facilities would be designed and constructed to avoid raptor perching (for predation purposes and to minimize the risk of being electrocuted). However, the long-term presence of structures and communication towers would pose a risk of collision and direct mortality.

The average hourly noise level during construction for the utilities would be 84 dBA (at 50 feet) without helicopter use and 100 dBA (at 50 feet) with helicopter use and attenuate to 55 dBA approximately 53 feet from the substation during operations (Forest Service 2022d). As such, the SGP would not be expected to result in permanent hearing loss for birds. Noise- and light-reduction strategies described for the mine site and for other general wildlife species would be used to reduce indirect effects on migratory bird species.

Construction effects (i.e., displacement) to these areas would be temporary, but long-term effects could include habitat fragmentation due to the utility corridors. The 2021 MMP components that may present a barrier to the movement of sensitive migratory bird species (i.e., smaller birds or those that use mature interior forest).

Off-Site Facilities

The 2021 MMP is unlikely to directly disturb migratory bird species in the wildlife analysis area, because only approximately 4 acres of habitat would be affected due to clearing and construction activities for off-site facilities. Direct take of adult birds due to these activities is unlikely, because most individuals are expected to avoid areas of activity. It also is unlikely that nests, eggs, and young would be disturbed by vegetation removal because nest sites are most likely not adjacent to roadways where the facilities would be built.

The average hourly noise level during construction for the off-site facilities would be 85 dBA (at 50 feet) and 84 dBA (at 50 feet) due to the borrow area activity during operations (Forest Service 2022d). As such, the SGP would not be expected to result in permanent hearing loss for birds. Noise- and light-
reduction strategies described for the mine site and for other general wildlife species would be used to reduce indirect effects on migratory bird species.

4.13.2.3 Johnson Creek Route Alternative

Impacts under the Johnson Creek Route Alternative for the Operations Area Boundary and utilities would be the same as discussed under the 2021 MMP as there are no changes to these features from the 2021 MMP. Therefore, these features are not discussed further in this section. Under the Johnson Creek Route Alternative, the only difference to off-site facilities is the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP. Also, the Burntlog Route would not be constructed and therefore wildlife impacts related to that would not occur. Off-site facilities are only discussed below for species where impacts would be different than the 2021 MMP.

Threatened, Endangered, Proposed, and Candidate Species

Canada Lynx

Under the Johnson Creek Route Alternative, the Johnson Creek Route would be used instead of the Burntlog Route, which would eliminate the disturbance of 15 miles of habitat adjacent to the FCRNRW. This would avoid the impacts of noise, light, and traffic on Canada lynx in the FCRNRW area where suitable current habitat is mapped. However, it is expected that transient Canada lynx would still cross SGP area roadways, including the Johnson Creek Route. Traffic levels on Stibnite Road and Johnson Creek Road (both part of the Johnson Creek Route) would increase by about 167 percent and 71 percent, respectively, during operations. Therefore, there would still be a chance of wildlife mortality under the Johnson Creek Route Alternative.

Table 4.13-1 shows the acres of suitable habitat that would be directly impacted in each LAU. Direct impacts to Canada lynx habitat across all LAUs would be 175 acres under the Johnson Creek Route Alternative. Using a 5-mile buffer on the SGP components within each LAU, the area of indirect impacts on Canada lynx habitat could total approximately 70,652 acres under the Johnson Creek Route Alternative.

The Forest Service has preliminarily determined that the mine site, access roads, and utilities would affect, but not adversely affect, Canada lynx utilizing the area or their habitat. The off-site facilities would likely not affect transient Canada lynx under any action alternative. The Stibnite LAU and Burntlog LAU would have the highest direct impacts to lynx habitat. Informal Section 7 ESA consultation is ongoing with the USFWS. Therefore, based on the impact analysis for the Canada lynx and its habitat, the 2021 MMP would result primarily in localized, long-term, and permanent, minor impacts to the Canada lynx.

Northern Idaho Ground Squirrel

Under the Johnson Creek Route Alternative, the Johnson Creek Route does not cross modeled suitable habitat, although it is in closer proximity to modeled suitable habitat than the Burntlog Route. Construction and operations would not likely impact NIDGS habitat. Direct impacts to NIDGS modeled habitat across the wildlife analysis area would be approximately 63 acres for the Johnson Creek Route
Alternative. Using a 1-mile buffer on SGP components, the indirect area of impacts on modeled NIDGS suitable habitat is approximately 5,248 acres.

The Forest Service has preliminarily determined that the access roads and utilities would affect, a small amount of NIDGS suitable habitat and direct and indirect impacts would be the same. The mine site and off-site facilities would not affect NIDGS habitat. Overall impacts from the SGP would affect, but not adversely affect, NIDGS. Informal Section 7 ESA consultation is ongoing with the USFWS. Therefore, based on the impact analysis for the NIDGS and its habitat, the Johnson Creek Route Alternative would result primarily in localized, temporary, and short-term, minor impacts to the NIDGS.

**Wolverine**

Under the Johnson Creek Route Alternative, the Johnson Creek Route would be used instead of the Burntlog Route, which would eliminate the disturbance of 15 miles of wolverine habitat adjacent to the FCRNRW. This would avoid the impacts of noise, light, and traffic impacts on wolverines in the FCRNRW area. Additionally, the Johnson Creek Route would mostly avoid areas mapped as persistent spring snow cover, which are areas expected to be used most by wolverines (Table 4.13-2). However, it is expected that wolverines would still cross SGP area roadways, including the Johnson Creek Route. Traffic levels on Stibnite Road and Johnson Creek Road (both part of the Johnson Creek Route) would increase by about 167 percent and 71 percent, respectively, during operations. Therefore, there would still be a chance of wildlife mortality under the Johnson Creek Route Alternative. Under the Johnson Creek Route Alternative, utilities would be constructed and installed using helicopters in IRAs rather than by constructing access roads. This would introduce more noise impacts to wolverines in their vicinity during construction. For example, noise from transmission line construction with helicopter use would attenuate to the threshold of 55 dBA approximately 1.70 miles from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from transmission line construction with helicopter use would attenuate to 55 dBA approximately 0.66 mile from the source of activity (Forest Service 2022d). During operations, the utilities would produce the same noise levels as the 2021 MMP.

The Forest Service has preliminarily determined that the Johnson Creek Route Alternative may directly and indirectly impact wolverine individuals and habitat resulting in adverse impacts but would not jeopardize the continued existence of the species. Informal Section 7 ESA consultation is ongoing with the USFWS. The Johnson Creek Route Alternative would impact the least habitat overall, but still reduce habitat connectivity, and potentially cause displacement (primarily from increased noise), based on direct and indirect impacts. Therefore, based on the impact analysis for the wolverine and its habitat, the Johnson Creek Route Alternative would result in localized and long-term impacts to the wolverine, particularly the local population (part of larger Central Idaho sub-populations).

**Monarch Butterfly**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. This would avoid effects of noise disturbance, fugitive dust, habitat loss, and habitat fragmentation to the Monarch butterfly in the vicinity of Burnt Log Road (FR 447). However, Monarch butterflies that currently utilize habitats along the Johnson Creek Route would likely be more impacted due to increased fugitive dust and noise disturbance from increased traffic.
The Johnson Creek Route Alternative may directly and indirectly impact Monarch butterflies and habitat. However, due to the low potential for this species to occur in the wildlife analysis area, primarily due to a lack of suitable habitat, the Johnson Creek Route Alternative would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, based on the impact analysis for the Monarch butterfly and its habitat, the Johnson Creek Route Alternative would result in negligible impacts to the Monarch butterfly.

**Focal Species, Including Region 4 Sensitive Species and Management Indicator Species**

**Habitat Family 1 – Low Elevation, Old Forest**

*White Headed Woodpecker*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. There is modeled habitat for white-headed woodpecker along the Johnson Creek Route. Because the Stibnite Road and Johnson Creek Road are existing roadways that would be upgraded, there would be approximately 8 acres of direct impacts on white-headed woodpecker habitat (Table 4.13-3), and there would be more indirect impacts due to noise, light, and fugitive dust disturbance from increased traffic levels.

*Lewis’s Woodpecker*

Effects to the Lewis’s woodpecker along the access roads under the Johnson Creek Route Alternative would be similar to the white-headed woodpecker analysis. Approximately 19 acres of modeled habitat (Table 4.13-4) would be impacted along the access roads for the Johnson Creek Route Alternative.

**Habitat Family 2 – Broad Elevation, Old Forest**

*American Three-toe Woodpecker*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. However, there would be a direct impact of 1 acre of modeled habitat associated with upgrades to the Johnson Creek Route. Additionally, the increased traffic along Stibnite Road, Johnson Creek Road, and Warm Lake Road would cause indirect impacts to woodpeckers using the modeled habitat within 0.5 mile of the roadways due to noise, light, and fugitive dust (Table 4.13-5).

Under the Johnson Creek Route Alternative, the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP and cause a direct impact of about 1 acre. It is not expected that this change would cause effects different from the 2021 MMP.

*Black-backed Woodpecker*

Effects to the black-backed woodpecker at the mine site would be similar to the American three-toed woodpecker analysis. However, there would be a direct impact of 45 acres of modeled habitat under the Johnson Creek Route Alternative (Table 3.13-6).

The Johnson Creek Route Alternative would directly impact 14 acres of modeled habitat, due to shifting the primary access route to the Johnson Creek Route. There would also be indirect impacts along this
route due to an abundance of modeled habitat along Stibnite Road, Johnson Creek Road, and Warm Lake Road.

*Dusky Grouse*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. Most of the modeled dusky grouse habitat is located in proximity to the Johnson Creek Route. As such, dusky grouse could be impacted by the Johnson Creek Route Alternative along the access roads due to direct impacts of 68 acres (Table 3.13-7). Indirect impacts for the Johnson Creek Route Alternative would be the same as for the 2021 MMP.

*Boreal Owl*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed or used. While 13 acres of modeled habitat (Table 4.13-8) would be directly impacted under this alternative, there is modeled suitable habitat located along the Johnson Creek Route that could be indirectly affected by noise and light from increased traffic levels.

The Johnson Creek Route Alternative may directly and indirectly impact boreal owl individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. The Johnson Creek Route Alternative would directly impact 36 acres of habitat. Therefore, based on the impact analysis for the boreal owl and its habitat, the Johnson Creek Route Alternative would result primarily in localized, long-term and permanent, minor impacts to the boreal owl.

Under the Johnson Creek Route Alternative, the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP. While the facility would be closer to modeled habitat, it is not expected that this change would cause different effects from the 2021 MMP.

*Fisher*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed and there would be approximately 1 acre of direct impacts on modeled habitat (Table 4.13-9) associated with the Johnson Creek Route. Indirect effects would also be likely within 1 mile of the Johnson Creek Route, as modeled habitat occurs along Stibnite Road, Johnson Creek Road, and Warm Lake Road.

Under the Johnson Creek Route Alternative, the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP. This would cause less than 1 acre of direct impacts to fisher; however, it is not expected that this change would cause effects different from the 2021 MMP.

*Flammulated Owl*

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. Most of the modeled suitable flammulated owl habitat is located in proximity to the Johnson Creek Route Alternative. As such,
there would be 22 acres of direct impacts to modeled habitat associated with the Johnson Creek Route (Table 4.13-10). Indirect effects (e.g., noise, light, fugitive dust, emissions) would also be likely due to modeled habitat occurring along the Stibnite Road, Johnson Creek Road, and Warm Lake Road.

**Great Gray Owl**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed or used. Direct impacts on modeled habitat would total approximately 13 acres and would be associated with upgrades along the Johnson Creek Route (Table 4.13-11). Additionally, there is modeled suitable habitat located along the Johnson Creek Route that could be indirectly affected by noise and light from increased traffic levels.

Under the Johnson Creek Route Alternative, the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP. While this would result in 2 acres of direct impacts to modeled habitat, it is not expected that this change would cause effects different from the 2021 MMP.

**Northern Goshawk**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed or used. Direct impacts on modeled habitat would total approximately 15 acres and would be associated with upgrades along the Johnson Creek Route (Table 4.13-12). Additionally, there is modeled habitat located along the Johnson Creek Route that could be indirectly affected by noise and light from increased traffic levels.

The Johnson Creek Route Alternative may directly and indirectly impact northern goshawk individuals and habitat but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. The Johnson Creek Route Alternative would directly and indirectly impact the least amount of habitat. Therefore, based on the impact analysis for the northern goshawk and its habitat, the Johnson Creek Route Alternative would result primarily in localized, long-term and permanent, minor impacts to the northern goshawk.

Under the Johnson Creek Route Alternative, the Landmark Maintenance Facility would be relocated to the southern side of Warm Lake Road, which would shift the footprint slightly versus the 2021 MMP. While this would result in 1 acre of direct impacts to modeled habitat, it is not expected that this change would cause effects different from the 2021 MMP.

**Pileated Woodpecker**

Effects to the pileated woodpecker along the access roads under the Johnson Creek Route Alternative would be similar to the white-headed woodpecker analysis, as pileated woodpeckers and modeled habitat are rare along the access roads.

There would be 0.5 acre of direct impacts to modeled habitat along the access roads for the Johnson Creek Route Alternative (Table 4.13-12). Indirect impacts could include displacement due to noise, light, or fugitive dust, and design features described for the white-headed woodpecker would likely reduce those impacts. Although modeled habitat is limited in the wildlife analysis area, individuals are present
during the breeding season. The Johnson Creek Route Alternative would likely have no direct impacts on pileated woodpecker modeled habitat (e.g., large and very large tree size classes in several different forest stands) but may affect individuals and there would be similar indirect impacts across all the Johnson Creek Route Alternative. Therefore, based on the impact analysis for the pileated woodpecker and its habitat, the Johnson Creek Route Alternative would result primarily in localized, long-term and permanent, minor impacts to the pileated woodpecker.

Silver-haired Bat

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. While more of the modeled silver-haired bat habitat is located in proximity to the Johnson Creek Route, direct impacts would total approximately 87 acres (Table 4.13-14). Due to the modeled habitat along the Johnson Creek Route, there would be indirect impacts due to increased traffic levels (e.g., noise, light, and fugitive dust) and emissions.

Habitat Family 3 – Forest Mosaic

Mountain Quail

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. There would be 115 acres of direct impacts to modeled habitat, which would be associated with upgrades to the existing Johnson Creek Route (Table 4.13-15). Indirect effects due to traffic noise, light, and fugitive dust would be expected within 1 mile of the Johnson Creek Route.

Habitat Family 5 – Forest and Range Mosaic

Gray Wolf

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built, and the Johnson Creek Route would be used instead. This would shift disturbance away from the FCRNRW area, where gray wolf packs are known to occur.

Peregrine Falcon

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. There are known breeding territories within the FCRNRW area that would not be impacted under the Johnson Creek Route Alternative. However, traffic would be higher along the Johnson Creek Route (Johnson Creek and the East Fork SFSR), where nesting also has been documented, and this would be an indirect impact.

Rocky Mountain Bighorn Sheep

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. However, there is a comparable amount of modeled suitable habitat adjacent to the Johnson Creek Route as well. There would be 57 acres of direct impacts to modeled summer habitat and 22 acres of direct impacts to modeled winter habitat under the Johnson Creek Route Alternative (Table 4.13-16).


**Townsend’s Big-eared Bat**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be built and habitat along that corridor would not be impacted. However, bats along the Johnson Creek Route may be impacted in a similar manner.

**Habitat Family 13 – Riverine Riparian and Wetland**

**Bald Eagle**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed and thus the area associated with the Burntlog Route would not be impacted. However, since there are known nest sites along the Johnson Creek Route, the increased traffic under the Johnson Creek Route Alternative may displace eagles from these territories.

**Columbia Spotted Frog**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed and there would be no impacts along the proposed Burntlog Route corridor. There would be 126 acres of direct impacts to modeled habitat under the Johnson Creek Route Alternative (**Table 4.13-17**). Increased traffic along the existing Johnson Creek Route would likely increase direct mortality and indirect impacts (due to noise, light, and fugitive dust) along these roadways.

**Idaho Species of Greatest Conservation Concern**

Impacts to SGCN are the same as for the 2021 MMP expect as outlined below.

**General Habitat Species**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. All traffic would access the SGP area via the Johnson Creek Route. General habitat SGCN with occurrence along these existing roadways may be impacted from increased traffic levels.

**Riparian species**

Under the Johnson Creek Route Alternative, there would be no impacts associated with the Burntlog Route as it would not be constructed. However, riparian SGCN along the Johnson Creek Route may be impacted from the increased traffic.

**Alpine Species**

Under the Johnson Creek Route Alternative, there would be a reduction of impacts due to the Burntlog Route not being built. However, any habitats adjacent to the Johnson Creek Route would be impacted from upgrades and increased traffic levels.

**General Wildlife Species**

Impacts to general wildlife are the same as for the 2021 MMP expect as outlined below.
Under the Johnson Creek Route Alternative, the Burntlog Route would not be built. This would avoid effects of noise disturbance, fugitive dust, habitat loss, and habitat fragment on wildlife in the vicinity of Burnt Log Road (FR 447). However, general wildlife species that currently utilize habitats along the Johnson Creek Route would likely be more impacted due to increased fugitive dust and noise disturbance from increased traffic.

**Big Game Species**

Impacts to big game species are the same as for the 2021 MMP expect as outlined below.

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. Impacts to big game species in the vicinity of Burnt Log Road (FR 447) would likely be avoided. However, big game species that currently utilize habitats along the Johnson Creek Route would be impacted due to increased traffic and noise disturbance associated with only using Johnson Creek Route for the SGP.

**Migratory Bird Species and Bald and Golden Eagles**

Impacts to migratory birds and bald and golden eagles are the same as for the 2021 MMP expect as outlined below.

- Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. However, the existing roadways included in the Johnson Creek Route would be upgraded and would likely cause direct and indirect impacts to migratory birds. Due to the increased fugitive dust and noise disturbance from increased traffic, the Johnson Creek Route may present a barrier to movement of sensitive migratory bird species.

**4.13.3 Mitigation Measures**

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Wildlife and Wildlife Habitat.

**4.13.4 Irreversible and Irretrievable Commitments of Public Resources**

**4.13.4.1 No Action Alternative**

There would be no irreversible and/or irretrievable commitment of resources under the No Action Alternative.

**4.13.4.2 Action Alternatives**

Although most wildlife species are considered renewable, certain biological resources that would be affected by the 2021 MMP and Johnson Creek Route Alternative are renewable only over long-time spans, including mature vegetation, including snags, seedbanks, and topsoil. Loss of these resources would be considered irreversible. Reclamation of high-value habitats for wildlife species such as Canada lynx, wolverines and migratory bird species may require long periods of time (decades). Impacts to
populations of threatened or endangered species, or species with low populations, such as Canada lynx or wolverine, would be considered irreversible, because recovery may take a long period of time or not occur at all. The direct mortality of wildlife also would be an irreversible impact.

Irretrievable commitments include biological resources that are renewable over a short time, such as vegetation, wetlands, and streams. Although the loss of the resource itself is reversible, the temporal loss of the use of the resource is irretrievable. The 2021 MMP and Johnson Creek Route Alternative activities would cause a temporal loss of habitat for a number of species; both from direct removal of vegetation, and indirectly through avoidance due to human presence. Some species sensitive to human presence, such as Canada lynx and wolverine, may not return to the area for years after the mine is closed.

Injury or mortality of individuals, such as burrow-dwelling species and slow-moving species that are unable to relocate when ground-disturbance activities begin, or through vehicle or transmission line collisions, would result in an irretrievable commitment of these resources. Although most animals displaced from the affected areas are expected to survive relocation, some displaced animals may not survive due to the associated dangers of migration and competition for resources; their loss also would be irretrievable.

Any reduction in habitat functions also would be irretrievable. Once the habitat is reclaimed to its full function, the irretrievable loss would only be the temporal loss of habitat during the period before it was reclaimed. Some vegetation and soil habitats would be lost for future use by wildlife until reclamation could be successfully implemented. Wildlife displaced from the affected habitat may relocate throughout the region, changing the availability of game for hunters and predators. The change could increase or decrease hunting success, but any reduction in game availability would represent an irretrievable loss of opportunity.

Under the Johnson Creek Route Alternative, there would not be improvements or construction of new segments for Burntlog Route, which would be a significant reduction of irretrievable commitments compared to the 2021 MMP. Relocation of the maintenance facility could affect different habitats.

4.13.5 Short-term Uses versus Long-term Productivity

4.13.5.1 No Action Alternative

The No Action Alternative is not expected to affect the long-term productivity of the environment.

4.13.5.2 Action Alternatives

Wildlife resources contribute to biological productivity, and the long-term productivity of these resources provides economic, ecological, and recreational benefits. Construction and operation of the SGP would result in some temporary, short-, mid-, and long-term impacts on wildlife. During construction, wildlife habitat would be removed from the footprint of the proposed Operations Area Boundary and from land associated with off-site facilities, access roads, and utilities. Habitat loss would be short-term in some areas, and long-term in others, depending on the type of vegetative cover. Timbered areas to be cleared would take decades to re-generate, during which a loss of primary and secondary habitat for many species would occur. Natural recovery and reclamation of habitat would take place outside the footprint of the
SGP after construction activities cease. Additional habitat would be lost for the duration of the SGP, because the increase in human activity would cause avoidance of the area by certain sensitive wildlife species. The risk of wildlife injury or mortality also would be increased as a result of the increase in human activity.

These short-term impacts would persist long enough to potentially affect the long-term productivity for some sensitive wildlife species or those with limited habitat. It is possible that some species would not return to the area after being displaced, which would be a long-term impact.

Although there would be construction or operational differences, the Johnson Creek Route Alternative would have short-term effects similar to the 2021 MMP. The exception is that upgrading the Johnson Creek Route would have fewer long-term impacts to many sensitive species and habitats than developing the Burntlog Route under the 2021 MMP.

4.14 Timber Resources

4.14.1 Impact Definitions and Effects Analysis Indicators and Methodology

The analysis of effects to timber resources includes the following issue and indicators:

**Issue:** The SGP may change the availability of timber resources, including sawtimber and special forest products.

**Indicators:**

- Volumes and acres of timber resources removed.
- Acres of timberland (including land suited for timber production) converted to other, non-productive land uses.

Timber resources were analyzed using GIS spatial analyses, scientific literature reviews, FSHs and FSMs, Forest Service land and resource management plans, and other information and analysis documented in reports prepared by and for Perpetua.

The assessment of potential effects related to the timber issue and its associated indicators are organized and analyzed for the alternatives by the underlying timber management responsibility (either Forest Service or other federal, state, and private). Where appropriate, the analysis is further organized by merchantable sawtimber versus sub-merchantable timber that could be sold as special forest products (e.g., Christmas trees, post and poles, and live transplants).

Analysis of direct effects on timber resources is limited to the analysis area as defined in Section 3.14.1. A qualitative analysis of indirect effects on timberlands also is included. The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1. The methods used to estimate the quantity and extent of timber resources in the analysis area (AECOM 2020i) and the analysis of impacts on timber resources is summarized below based on the components of each action alternative provided by Perpetua (Perpetua 2021a).
4.14.1.1 Timber Volume

Volume of timber was estimated in the analysis area by extracting sampled vegetation characteristics from the VCMQI mapping for the PNF and BNF, including timber dominance type, tree size, and canopy cover, from the GIS to create a set of unique stand conditions. The resulting 200 stand conditions represent all of the combinations of the eight timber types found in the analysis area, the five tree-size classes in the VCMQI (i.e., seedling, sapling, small, medium, and large); and the five canopy cover classes in the VCMQI (i.e., low, low-medium, medium, medium-high, and high). Only trees greater than 10 inches in diameter at breast height, which corresponds to medium and large trees, are considered merchantable sawtimber; seedling, sapling, and small trees are considered special forest products on the PNF and BNF.

To estimate average volume per acre for each of the 200 stand conditions, generalized forest strata data were combined with available Forest Service inventory data, which provided estimates of trees per acre in each stand type; and estimates of volume per tree, by species and size class (Forest Service 2017h, 2017i). The resulting stand-volume table, containing volume-per-acre estimates for all 200 unique stand conditions, was applied to mapped timberlands in the analysis area. Timber volume was estimated in cubic feet, which is a full-log volume measurement. The board foot is the unit of measure for wood intended for the finished wood product market, and the timber volume unit used in the Payette Forest Plan and Boise Forest Plan. To compare estimates of timber volume to the PNF and BNF timber extraction goals, cubic feet of timber was converted to MBF using Cahill’s conversion factor for 16-inch log diameters. The factor is “5.24 cubic meters of wood per thousand board feet,” and is based on the Westside Scribner rule with log lengths up to 40 feet and assumes no reduction in volume for defects (Spelter 2004). Timber volumes presented in the discussions are distinguished between sawtimber and sub-merchantable trees; however, a breakdown by species is not provided.

4.14.1.2 Methodology and Assumptions

The following methodology and assumptions were used in the analysis:

- All portions of the analysis area within the PNF and BNF boundaries were characterized by existing VCMQI vegetation dominance types, using spatial data developed by the PNF and BNF, with a minimum polygon size of 5 acres. These data were not developed to characterize timber resources, and therefore the conifer landform was used as a proxy for timberland but has associated limitations. Limitations include: 1) not all areas mapped as coniferous forest lifeform are productive timberlands; 2) many of the sparser conifer stands (10 to 30 percent canopy) may not have been mapped as coniferous forest lifeform, instead many of these fell into various shrubland categories or burned categories (Forest Service 2019j); 3) the minimum mapping unit of 5 acres is not small enough to capture all developed roads and other narrow cleared corridors, and therefore the mapped extent of vegetation may extend across these developed, unvegetated areas; and 4) existing roaded areas fell below the minimum mapping unit and although they do not contain timber, some portions of mapped timber resource polygons include roaded areas devoid of trees.
- Beyond the limitations associated with VCMQI mapping accuracy on NFS lands, these data were not available for portions of the SGP area on private, state, and other federal land. To characterize vegetation in these areas, publicly available vegetation community LANDFIRE data with a 30-
square-meter minimum mapping unit were manually translated (“cross-walked”) to the closest corresponding NFS vegetation dominance type. LANDFIRE data are not ground-truthed; therefore, vegetation conditions on private, state, and other federal land may be less accurately represented than conditions on NFS lands.

- Although the Reclamation and Closure Plan (Tetra Tech 2021a) indicates that some portion of forest resources in the analysis area would be used during mine operations, and some portion may be harvested for sale (as timber), Perpetua does not provide an acreage estimate or indicate the location of forest resources intended for each use. In the absence of this information, all forested areas in the analysis area meeting the definition of timber resources were assumed to be harvested for sale during SGP construction and operations.

- In the absence of timber cruises (i.e., a sample measurement of a stand used to estimate the amount of standing timber that the forest contains) for the SGP area, the volume and distribution of sawtimber and special forest products on the landscape can only be approximated from landscape-level vegetation mapping at a minimum mapping unit of 5 acres. Therefore, the data may indicate that some areas contain timber or special forest products, while a timber cruise of the area may reveal different conditions.

Additional analytical assumptions that were made in order to develop a consistent, repeatable analysis for the SGP are detailed in the Timber Resources Methodology and Impact Analysis Report (AECOM 2020i) but rerun based on revised SGP components by action alternative (Perpetua 2021a).

**4.14.2 Direct and Indirect Effects**

The harvest and sale of timber is an intended use of NFS lands; however, to protect multiple uses and promote the sustained yield of timber, the Forest Service provides detailed management direction for how and where harvesting on NFS lands is to occur. The effects of removing timber off NFS lands are examined in the context of how consistent the removal and regeneration methods are, as well as location and volume of timber removed, with NFS timber harvest rules and Forest Plan standards and guidelines. Timber removal from non-NFS lands in the analysis area are viewed in the context of state and local regulations governing removal and sale of wood products. Forest Service timber management guidelines do not apply on these lands.

Direct effects to timber resources on NFS-managed lands (“Forest Service timber”) would include timber removal volume, acreage, and/or practices that conflict with Forest Service direction. Specifically, direct impacts would include:

- Removal of volume that exceeds annual harvest limits (TSPQ, ASQ, Wood Volume) set by each forest (Table 3.14-2).

- Removal of timberland acreage from unsuited areas, or of a quantity that exceeds the acres suited for timber production designated in the Payette or Boise Forest Plans.

- Regeneration of timber resources does not achieve adequate restocking within 5 years of final harvest (16 USC 1604(g)(3)(E)(ii)).
Direct effects to timber resources on other federal, state, and private lands may include timber harvest practices on commercial timberlands that conflict with the Idaho Forest Practices Act and associated guidelines. Specifically, direct effects would include:

- Removal of timber from commercial timberlands in ways that conflict with standards for logging operations, soil protection, stream protection, and restocking of stands.
- Timber harvest practices that generally do not maintain and enhance natural resources.

Indirect effects on timber resources could include delayed or prolonged growth and recovery of timber species because of removal of suitable soil, seed bank, and understory conditions during operations. Indirect impacts also could include development of unhealthy timber stands from the introduction of pathogens, including insects and disease, or the reintroduction of genetically unsuitable plantings or seed. Indirect effects would be a function of harvest method and reclamation strategy, which are anticipated to be the same across the entire SGP area. Therefore, indirect effects on timber resources are anticipated in all portions of the SGP area where timber removal would occur.

Direct and indirect effects associated with timber resources during construction and operations are based on management standards, which differ between the Forest Service and the State of Idaho or Valley County; the discussion below is organized to reflect those differences. Effective replanting and regeneration, and achievement of regeneration standards during closure and reclamation could decrease impacts to timber resources from operations and closure. However, inadequate efforts to return timberland to forested vegetation could increase the duration and extent of direct and indirect effects to the resource.

4.14.2.1 No Action Alternative

Under the No Action Alternative, the mining, ore processing, and related SGP activities would not take place and there would be no direct or indirect effects to timber resources and no changes to current conditions for timber resources in the analysis area from the SGP. However, existing and approved activities (i.e., approved exploration activities and associated reclamation obligations) would continue and Perpetua would not be precluded from subsequently submitting another plan of operations pursuant to the Mining Law.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project EA (Forest Service 2015c). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the mine site. These exploration and subsequent reclamation activities would have only a small direct effect on timber resources, as the disturbance footprint associated with the Golden Meadows EA is limited to the temporary access roads to pads and the exploration drilling holes.

Perpetua would be required to continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using
standard reclamation practices, and monitoring to ensure that sediment and stormwater BMPs are in place and effective so that impacts to timber resources are avoided or minimized.

### 4.14.2.2 2021 MMP

**Construction and Operations**

Merchantable timber cut during construction and operations may be sold as part of the 2021 MMP. Vegetation clearing for the action alternatives would impact between 595 acres containing 438,243 CF of sawtimber and sub-merchantable product under the 2021 MMP. This would result primarily in localized, long-term and permanent, minor impacts to timber resources. The analysis area under the 2021 MMP contains 54 acres of land suited for timber production, which is associated with the existing transmission line upgrade (within BNF MPC 5.1 and 4.2) and contains 206 MBF of sawtimber. There is no suited timberland in the analysis area on the PNF under either action alternative.

Tables 4.14-1 and 4.14-2 show the area of timber resources and associated volume of wood removed during construction and operations under each of the action alternatives on NFS land as well as other public or private land.

**Table 4.14-1 Impacts to Timber Resources by Action Alternative: Volume of Timber Removed (cubic feet)**

<table>
<thead>
<tr>
<th>Land Management</th>
<th>SGP Component</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service</td>
<td>Access Roads</td>
<td>53,522</td>
<td>161,779</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Mine Site</td>
<td>166,316</td>
<td>161,012</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Off-site Facilities</td>
<td>0</td>
<td>1,884</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Utilities</td>
<td>122,604</td>
<td>122,383</td>
</tr>
<tr>
<td>Forest Service</td>
<td>All Components, Subtotal</td>
<td>342,442</td>
<td>447,058</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Access Roads</td>
<td>1,953</td>
<td>10,078</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Mine Site</td>
<td>36,518</td>
<td>33,516</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Off-site Facilities</td>
<td>3,952</td>
<td>3,952</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Utilities</td>
<td>53,378</td>
<td>53,380</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>All Components, Subtotal</td>
<td>95,801</td>
<td>100,926</td>
</tr>
<tr>
<td>All Lands</td>
<td>All SGP Components¹</td>
<td>438,243</td>
<td>547,984</td>
</tr>
</tbody>
</table>

Source: Compiled by AECOM in 2020 from Forest Service vegetation and fire data (Forest Service 2016b, 2016c; 2017a and b); Midas Gold Mine Claim spatial data (Brown and Caldwell 2017b); Perpetua Project components (Perpetua 2021a), and AECOM timber volume formulas (AECOM 2020i).

¹ All quantities have been rounded; therefore, column and row totals may not add up exactly due to rounding performed in source data.

Timber resources would be removed during the construction phase, and the soil surface cleared and grubbed to accommodate roads and infrastructure. Timber resources would be largely prevented from reestablishing through the operations period due to the ongoing need for the underlying ground to accommodate structures, facilities, and access routes. Exceptions to this timeline would occur along
Burntlog Route (under the 2021 MMP), which would remain in use throughout the closure and reclamation phase. Construction and operations would have long-term effects on the availability and extent of timber resources in the analysis area. These effects would be long-term because timber resources would be removed at the start of the 2021 MMP, during the construction period, and the disturbed areas would remain largely unavailable for planting or regrowth for over 15 years. In addition, the 2021 MMP include permanent impacts on the availability and extent of timber resources through the permanent conversion of existing timber resources to other, non-timber uses, including the expanded ROW for the existing transmission line and the permanent, continued use of the Stibnite Road.

Table 4.14-2  Impacts to Timber Resources by Action Alternative: Area of Timber Removed (acres)

<table>
<thead>
<tr>
<th>Land Management</th>
<th>SGP Component</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service</td>
<td>Access Roads</td>
<td>79</td>
<td>212</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Mine Site</td>
<td>146</td>
<td>142</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Off-site Facilities</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Forest Service</td>
<td>Utilities</td>
<td>243</td>
<td>242</td>
</tr>
<tr>
<td>Forest Service</td>
<td>All Components, Subtotal</td>
<td>468</td>
<td>601</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Access Roads</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Mine Site</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Off-site Facilities</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>Utilities</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Other Federal, State and Private</td>
<td>All Components, Subtotal</td>
<td>127</td>
<td>132</td>
</tr>
<tr>
<td>All Lands</td>
<td>All SGP Components¹</td>
<td>595</td>
<td>733</td>
</tr>
</tbody>
</table>

Source: Compiled from Forest Service vegetation and fire data (Forest Service 2016b, 2016c; 2017a, 2017b); Midas Gold Mine Claim spatial data (Brown and Caldwell 2017b); Perpetua Project components (Perpetua 2021a), and AECOM timber volume formulas (AECOM 2020i).

¹All quantities have been rounded; therefore, column and row totals may not add up exactly due to rounding performed in source data.

Permanent loss of timber resources would occur on 66 acres under the 2021 MMP. This would result primarily in localized, long-term and permanent, minor impacts to timber resources. Under the 2021 MMP and approximately 11 percent of the permanent loss of timber resources occurs on lands suited to timber production. This would result primarily in localized, long-term and permanent, minor impacts to timber resources.

The use and construction of the Burntlog Route under the 2021 MMP would require removal of only 16 acres of timber resources. This would result primarily in localized, long-term and permanent, minor impacts to timber resources.
Table 4.14-3  Comparison of Timber Resource Removal on Forest-Wide ASQ and TSPQ by the 2021 MMP and Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Harvest Metric</th>
<th>2021 MMP Contribution Towards Annual Maximum (MBF), percentage</th>
<th>Johnson Creek Route Alternative Contribution Towards Annual Maximum (MBF), percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNF TSPQ</td>
<td>899 MBF (2%)</td>
<td>870 MBF (2%)</td>
</tr>
<tr>
<td>PNF ASQ</td>
<td>0 MBF (0%)</td>
<td>0 MBF (0%)</td>
</tr>
<tr>
<td>BNF TSPQ</td>
<td>952 MBF (2%)</td>
<td>1,546 MBF (4%)</td>
</tr>
<tr>
<td>BNF ASQ</td>
<td>206 MBF (1%)</td>
<td>808 MBF (3%)</td>
</tr>
</tbody>
</table>

Source: Compiled from Forest Service vegetation and fire data (Forest Service 2016b, 2016c; 2017a, and 2017b), Brown and Caldwell 2017b; Perpetua Project components (Perpetua 2021a), and AECOM timber volume formulas (AECOM 2020i). MBF = thousand board feet; TSPQ = total sale program quantity; ASQ = allowable sale quantity

**Closure and Reclamation**

Reclamation of timber resources begins at the point when the analysis area can support the growth of timber species, the timing of which would vary spatially within the analysis area based on differing operations and closure timelines for different facilities and components. In areas where the ground surface would be cleared, grubbed, and graded during construction and operations, reclamation of timber resources would require the ground to be ripped, augmented with GM, and seeded/planted. In areas where minimal surface disturbance would be anticipated (i.e., the upgraded transmission line and associated tensioning/pulling areas), the removal of infrastructure would constitute the beginning of timber reestablishment. Most reclamation would occur in Mine Years 15 through 20, at which time replanting and site preparation at Yellow Pine pit, TSF Buttress, worker housing facility, and the new transmission line and associated infrastructure from Johnson Creek to the mine site would be initiated. As a result, timber resources would be absent from across the timber resources analysis area for more than 15 years until revegetation activities commence. Approximately 2 acres would be capable of natural regeneration from existing seedstock and seedlings (beneath the new transmission line) under the 2021 MMP, while the remaining 593 acres under the 2021 MMP would require a combination of site preparation techniques to support forest resource re-growth due to the intensity of the disturbance to existing soil and vegetation. Most disturbed areas planned for timber resource reclamation would not be prepared with GM or planted until operations are complete, including the Midnight GMS area, haul roads, the Yellow Pine pit walls, and North Yellow Pine GMS. The duration of impacts to timber resources, including lost timberland productivity, would be expected to persist for more than 15 years under all action alternatives.

To address losses of vegetation, 206 acres would be planted with conifer and other tree species. Areas identified for timber species replanting are entirely within the mine site, where lands would either be treated to regenerate forest conditions (planted at 81 trees per acre) or park-like conditions (planted at 170 trees per acre) under two conditions: cool aspect and general aspect. Planted timber species would include primarily Douglas-fir and lodgepole pine, with the inclusion of Engelman spruce on the cool-aspect sites (Tetra Tech 2021a).
To prepare disturbed sites for timber replanting, upland portions of the mine site would have 6 inches of stockpiled GM applied. Areas with a base of development rock or development rock and tailings (TSF) would have 12 inches of GM applied. Timber productivity generally correlates with soil depth and quality, which implies that the shallow depth of GM (6 inches) applied in most uplands where timber replanting is planned at final reclamation would likely limit native forest production. Productivity varies with other factors that are not equal across a site, such as moisture inputs, therefore an exact correlation between productivity and GM soil depth would not be expected. In addition, underlying “root zone material” influences productivity, because native forest trees may root several feet below the upper soil layers to exploit moisture and nutrients, and provide physical anchoring. In this case, the reclaimed sites over native soils or regolith material are therefore likely to be more productive than sites on development rock, despite the addition of 12 inches of GM on the TSF Buttress. Compared to native soils and regolith, mining substrates derived from deep in the earth present challenges to ecosystem reclamation (Cooke and Johnson 2002). These include physical characteristics of very coarse substrate in waste rock (development rock), and chemistry that is highly variable, but generally deficient in essential nutrients, and potentially high in other elements (metals) that may restrict plant growth.

Of the approximately 206 acres planned for revegetation in conifer species, at most 111 acres fall within the timber resources analysis area (i.e., where existing timber resources are located as well as planned for removal). The remaining areas are on portions of the analysis area that support grasslands, shrublands, and hardwood forest; or that were burned in the past and currently do not support timber resources. Table 4.14 presents the area of timber resources in the analysis areas; the area that would be planted with timber species and other vegetation such as shrub or grassland species according to the Reclamation and Closure Plan (Tetra Tech 2021a); and the portion of each analysis area that would not be replanted (reclaimed). A minimum of 370 acres under the 2021 MMP, would not be replanted under the SGP.

Given the existing disturbed quality of the ground surface in many areas, particularly at the mine site, timber regrowth would not be expected to occur for many years. The Reclamation and Closure Plan does not include reclamation planting plans for disturbed portions of the utility corridor, at the off-site facilities, or along access roads; where 96 acres of timber resources in the analysis area under the 2021 MMP would be removed. According to the Reclamation and Closure Plan, the new road sections of Burntlog Route under the 2021 MMP would be removed and ripped, while the upgraded portions would be narrowed to their current conditions, and the excess width would be reclaimed. However, due to the layout of the upgraded road sections (flatter grades and gentler curves), the post-mining condition would exceed the width of the existing condition, representing a small permanent loss of timber resources. Reclamation of new sections of Burntlog Route under the 2021 MMP would not commence until all final closure/reclamation has been completed at the end of the post-closure phase. In the absence of planting and GM placement, timberland regeneration along new sections of Burntlog Route would depend on natural seeding from adjacent forest and would likely take more than 20 years to establish.
### Table 4.14-4  Existing Timber Resource Area and Planned Replanting in the Analysis Areas of the 2021 MMP and Johnson Creek Route Alternative

<table>
<thead>
<tr>
<th>Action Alternative</th>
<th>Timber Resources in Analysis Area (acres)</th>
<th>Planted with Timber Species (acres)¹</th>
<th>Planted with Shrub or Grassland Species (acres)²</th>
<th>Timber Resources not Reclaimed (acres)</th>
<th>Percent of Analysis Area not reclaimed (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021 MMP</td>
<td>595</td>
<td>111</td>
<td>114</td>
<td>370</td>
<td>62%</td>
</tr>
<tr>
<td>Johnson Creek Route Alternative</td>
<td>733</td>
<td>111</td>
<td>114</td>
<td>508</td>
<td>69%</td>
</tr>
</tbody>
</table>

Source: Compiled from Forest Service vegetation and fire data (Forest Service 2016b, 2016c; 2017a and 2017b), Perpetua Project components (Perpetua 2021a), Tetra Tech 2021a, and Brown and Caldwell 2017b.

¹The area reclaimed to timber resources is based on the overlap of the analysis area for timber resources and the location of Forested and Parkland planting areas presented in the Reclamation and Closure Plan (Tetra Tech 2021a).

²The area reclaimed to shrubs or grassland is based on the overlap of the analysis area for timber resources and the location of Shrubland areas, as well as areas designated for seeding of grasses and herbaceous species presented in the Reclamation and Closure Plan (Tetra Tech 2021a).

Approximately 114 acres in the analysis area would be ripped, and receive other site preparation such as GM placement, but would not be planted with timber species. These areas would not be prevented from supporting timber species; however, the anticipated GM depths and subsurface materials in these locations would potentially be restrictive, particularly at providing rooting depths required by mature trees. Based on planting maps, and GM characteristics and placement plans, it is anticipated that at best, only 20 percent of the analysis area for the action alternatives could be adequately restocked within 5 years after final harvest. In most locations where timber resources would be removed, timber vegetation is not part of the planting plan (approximately 80 percent of the analysis area), and vegetation conditions would resemble either grasslands or shrublands, or remain bare for an extended period following closure and reclamation.

### 4.14.2.3 Johnson Creek Route Alternative

**Construction and Operations**

Merchantable timber cut during construction and operations may be sold as part of the Johnson Creek Route Alternative. Vegetation clearing would be completed on 733 acres containing 547,984 CF of sawtimber and sub-merchantable product under the Johnson Creek Route Alternative. This would result primarily in localized, long-term and permanent, minor impacts to timber resources. The Johnson Creek Route Alternative contains 123 acres of lands suited for timber production, which include the 54 acres associated with the transmission line upgrade (within BNF MPC 5.1 and 4.2) plus an additional 69 acres associated with the Johnson Creek Route (within BNF MPC 5.1). The suited timberlands under the Johnson Creek Route Alternative contain 808 MBF of sawtimber. There is no suited timberland in the analysis area on the PNF under either action alternative. Tables 4.14-1 and 4.14-2 show the area of timber resources and associated volume of wood removed during construction and operations under the Johnson Creek Route Alternative on NFS land as well as other public or private land.
Timber resources under either action alternative would be removed during the construction phase, and the soil surface cleared and grubbed to accommodate roads and infrastructure. Timber resources would be largely prevented from reestablishing through the operations period due to the ongoing need for the underlying ground to accommodate structures, facilities, and access routes. Exceptions to this timeline would occur along Burntlog Route (Under the 2021 MMP), which would remain in use throughout the closure and reclamation phase. Construction and operations under either action alternatives would have long-term effects on the availability and extent of timber resources in the analysis area. These effects would be long-term because timber resources would be removed at the start of the SGP, during the construction period, and the disturbed areas would remain largely unavailable for planting or regrowth for over 15 years. In addition, the action alternatives include permanent impacts on the availability and extent of timber resources through the permanent conversion of existing timber resources to other, non-timber uses, including the expanded ROW for the existing transmission line and the permanent, continued use of the upgraded Johnson Creek and Stibnite roads under the Johnson Creek Route Alternative.

The removal of timber resources from lands suited to timber production and unsuited lands, and the associated effect upon the PNF and BNF ASQ and TSPQ, are summarized in Table 4.14-3, which shows the Johnson Creek Route Alternative has a larger effect on the PNF TSPQ. Otherwise, it has an indistinguishable effect on the BNF ASQ and TSPQ between the action alternatives.

The Johnson Creek Route Alternative includes the use of the Johnson Creek Route for mine site access under the Johnson Creek Route Alternative instead of construction and use of the Burntlog Route and additional small differences, such as repeater sites along that route and the public access road through the mine site would also carry mine and supplier traffic to administration and worker housing facilities. Under the Johnson Creek Route Alternative, the use of the Johnson Creek Route for construction, operations, and closure and reclamation and the development of a groomed OSV route would increase the extent of timber resources removal by approximately 119 acres (most of which is on land managed by the Forest Service) over the 2021 MMP. This would result primarily in localized, long-term and permanent, minor impacts to timber resources.

The Johnson Creek Route Alternative includes public access roads through the mine site during construction, operations, and closure and reclamation. In addition, the Johnson Creek Route Alternative public access road also would serve as a mine delivery route. Timber resources removal associated with public access roads through the mine site is approximately 13 acres under the Johnson Creek Route Alternative. This would result primarily in localized, long-term and permanent, minor impacts to timber resources under the Johnson Creek Route Alternative.

All other construction and operations impacts to Timber Resources are as described for the 2021 MMP.

**Closure and Reclamation**

Up to 731 acres under the Johnson Creek Route Alternative would require a combination of site preparation techniques to support forest resource re-growth due to the intensity of the disturbance to existing soil and vegetation. Up to 508 acres under the Johnson Creek Route Alternative would not be replanted under the SGP (Table 4.14-4). The Johnson Creek Route Alternative timber analysis area would receive the largest replanting effort of all the action alternatives; however, it would involve the smallest timber resource reclamation effort, based upon reclamation area as a percent of disturbed area.
The Reclamation and Closure Plan does not include reclamation planting plans for disturbed portions of the utility corridor, at the off-site facilities, or along access roads where 104 acres of timber resources in the analysis area under the Johnson Creek Route Alternative occurs would be removed. All other closure and reclamation impacts to Timber Resources are as described for the 2021 MMP.

4.14.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Timber Resources.

4.14.4 Irreversible and Irretrievable Commitments of Public Resources

4.14.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. Consequently, no change would occur in the current status of timber resources in the analysis area, and no irretrievable or irreversible commitments of timber resources would occur.

4.14.4.2 Action Alternatives

An irreversible commitment of timber resources and land suited for timber production to other uses would occur in the expanded ROW associated with upgrades to the existing transmission line, which would not be returned to timberland at completion of the SGP. This permanent reduction of timberland would cover approximately 66 acres (2021 MMP) and 282 acres (Johnson Creek Route Alternative) in the analysis area and contain 12 acres (2021 MMP) and 28 acres (Johnson Creek Route Alternative) of land suited for timber production in MPCs 5.1 and 4.2, with approximately 206 MBF (2021 MMP) and 808 MBF (Johnson Creek Route Alternative) of sawtimber.

Although most timber species are considered to be renewable, certain timber resources that would be impacted under the 2021 MMP would be renewable only over long-time spans, including mature sawtimber. Growth of timber species in the analysis area would be affected and their growth particularly slowed, in highly disturbed portions of the mine site due to the loss of native soil resources and the long timespan required for replaced soil resources (GM) to recover productive capacity. In addition, some seedbanks and topsoil may have long recovery periods following the disturbance associated with the 2021 MMP. In most disturbed portions of the analysis area, timber re-growth would be prohibited for the duration of the construction and operations but would be encouraged to resume during the reclamation phase. During this phase, all facilities, structures, new access roads, and other components, excluding the expanded ROW around the transmission line upgrades, would be removed. Limited areas of previously occupied timberland at the mine site would be replanted, while much of the previously occupied timberland would be left to naturally re-seed from adjacent plant sources. Reestablishment of high-value timber resources may require decades or longer to return timber vegetation to the extent of the analysis area from which timber resources would be removed.
The removal of timber resources is an irretrievable commitment because of the long timespan required for timber resources renewal, particularly sawtimber. SGP-related activities throughout the analysis area would remove timber resources for 15 years at a minimum, and likely for as many as 50 years in some places. The removal of sub-merchantable product from the analysis area is an irretrievable commitment because special forest products derived from those sub-merchantable trees would be unavailable during operations and construction, and likely for an additional 5 or more years after replanting. In MPCs 5.1 and 4.2 in the BNF, the 2021 MMP would prohibit (but not permanently prevent) timber production on 4 acres (2021 MMP) and 10 acres (Johnson Creek Route Alternative) of land suited for timber production over approximately 20 years. Sawtimber and special forest product resources in these areas would be irretrievably affected.

4.14.5 Short-term Uses versus Long-term Productivity

4.14.5.1 No Action Alternative

Under the No Action Alternative, SGP activities related to construction, operations, closure and reclamation of the mine site and associated infrastructure would not be undertaken. Consequently, no change would occur in the extent or volume of timber resources or special forest products in the analysis area, and no impacts to productivity would occur.

4.14.5.2 Action Alternatives

Mine operations and connected actions would dominate land use, and predominantly prevent timber resources re-growth, on approximately 370 acres (2021 MMP) and 508 acres (Johnson Creek Route Alternative) of land containing existing timber resources (Table 4.14-3). After operations end, land uses affected by the mine, access roads, utilities, and off-site facilities would largely return to pre-SGP uses, except for the expanded ROW associated with the upgraded transmission line, which would be permanently removed from long-term timber productivity. The long-term productivity of most timberlands removed during construction and operations would therefore be temporarily reduced, but then would be facilitated through site preparation, seeding, and planting described in the Reclamation and Closure Plan. The effectiveness of GM reclamation and planting mix, techniques, and maintenance, would determine the long-term productivity of disturbed timber resources in the 2021 MMP analysis area. Based on analyses presented in Section 4.5.2, Direct and Indirect Effects to Soils, the long-term productivity of timber resources would be closely tied to the success of soil and GM reclamation. Some portions of the analysis area containing existing timber resources, particularly those in the footprints of the TSF, TSF Buttress, and pits, would likely never return to their pre-SGP productive capacity due to limitation on rooting depth related to the depth of the GM and waste rock that would function as substrate for the foreseeable future.
4.15  Land Use and Land Management

4.15.1  Impact Definitions and Effects Indicators and Methodology

The analysis of effects to land use and land management includes the following issues and indicators:

**Issue:** The SGP would cause changes in land use or land management.

**Indicators:**
- Acres of land used for SGP components by land management agency.
- Acres of total and new land disturbance within SGP area.

**Issue:** The SGP would cause changes in or create new rights-of-way (ROWs) or easements.

**Indicators:**
- Miles or acres of new or changed ROWs or easements, regardless of jurisdiction.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.15.2  Direct and Indirect Effects

4.15.2.1  No Action Alternative

Under the No Action Alternative, the SGP would not be implemented. The reclamation of legacy mining areas associated would not occur under the No Action Alternative. The Golden Meadows Exploration Project would occur near and within the analysis area and would include exploration activities to better define mineral potential in the area. The proposed exploration drilling areas would occur on NFS lands for a period of at least 3 years. No changes to land use or land management would be expected under the No Action Alternative.

4.15.2.2  2021 MMP

The 2021 MMP includes the potential to impact land use and land management through mine development and operations, construction of the Burntlog Route, construction of the SGLF and Burntlog Maintenance Facility, and the upgrade to and new construction of transmission lines. The 2021 MMP components and land management are shown in Figure 3.15-1.

**Land Management**

Under the 2021 MMP, the SGP area would disturb approximately 3,266 acres. NFS lands would comprise approximately 2,372 acres, or 73 percent, of the SGP area, of which 1,439 acres would be PNF-administered lands and 933 acres would be BNF-administered lands. Approximately 819 acres (25 percent) would be private lands, including lands owned by Perpetua, and 62 acres (2 percent) would be administered by the State of Idaho. Approximately 13 acres (less than 1 percent) would be administered by the BOR. Table 4.15-1 shows land management and acreage by major component.
Table 4.15-1  2021 MMP Disturbance Acreage by Component

<table>
<thead>
<tr>
<th>Component Subtotal</th>
<th>Private</th>
<th>State</th>
<th>BNF</th>
<th>PNF³</th>
<th>BOR</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site Subtotal¹</td>
<td>505</td>
<td>0</td>
<td>0</td>
<td>1,235</td>
<td>0</td>
<td>1,740</td>
</tr>
<tr>
<td>Access Roads Subtotal¹</td>
<td>6</td>
<td>0</td>
<td>356</td>
<td>123</td>
<td>0</td>
<td>485</td>
</tr>
<tr>
<td>Utilities Subtotal¹</td>
<td>284</td>
<td>62</td>
<td>572</td>
<td>81</td>
<td>12.5</td>
<td>1,012</td>
</tr>
<tr>
<td>Off-site Facilities Subtotal¹</td>
<td>24</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>Total²</td>
<td>819</td>
<td>62</td>
<td>933</td>
<td>1,439⁴</td>
<td>12.5</td>
<td>3,266</td>
</tr>
</tbody>
</table>

¹ Utilities acreages include upgrades to utilities that are part of the Connected Actions.
² Subtotals may not add to totals due to rounding.
³ Approximately 65 acres associated with surface exploration pads and temporary roads (mine site component) have unknown land management breakdown because the exact locations of these exploration areas are not yet known; however, these are included in the PNF mine site subtotal.
⁴ Approximately 14 acres of land listed under the PNF is administered by the PNF but is within the boundary of the Salmon-Challis National Forest.

Land Use

Operations Area Boundary Site

Portions of the Operations Area Boundary have been subject to mining activities for over a century. There are some patented and unpatented mining claims in the Operations Area Boundary which would not be utilized by the SGP while the 2021 MMP construction and operations would take place on approximately 512 acres of patented mining claims, and approximately 1,370 acres of unpatented mining claims (Table 4.15-2) on NFS land.

Table 4.15-2  2021 MMP Patented and Unpatented Mining Claims

<table>
<thead>
<tr>
<th>Mining Claim Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patented Claims (Acres)</td>
<td>512</td>
</tr>
<tr>
<td>% Patented Claims</td>
<td>27%</td>
</tr>
<tr>
<td>Unpatented Claims (Acres)</td>
<td>1,370</td>
</tr>
<tr>
<td>% Unpatented Claims</td>
<td>73%</td>
</tr>
<tr>
<td>Total Area (Acres)</td>
<td>1,882</td>
</tr>
</tbody>
</table>

Areas within the Operations Area Boundary are highly disturbed by past mining activities and show evidence of long-term mine operations as a dominant land use. However, development of the mine site has not occurred at the scale proposed for the 2021 MMP, and the mine operating footprint would extend beyond areas that have been previously disturbed from mining activity. Implementation of the 2021 MMP would change the land use from an area that has been intermittently disturbed and partially reclaimed, to an expanded area of industrial development.

Public access to and through the mine site is currently allowed and used for dispersed recreation, as well as access to surrounding areas for recreation. During construction and operation of the 2021 MMP, public use would not be allowed within the Operations Area Boundary; however, there would be a public access
road through the Operations Area Boundary (Figure 2.4-2). As discussed in Section 4.19, approximately 13,441 acres of NFS lands within the Operations Area Boundary would be inaccessible to dispersed recreation during construction and operation of the 2021 MMP (Forest Service 2022m). Public access to NFS lands within the Operations Area Boundary would be closed for timber harvest and designated tribal uses (Sections 4.14 and 4.24).

The 2021 MMP would expand on the past and current land use of mining and mining-related activities and would restrict public access. This land use would be considered a direct impact. The duration of direct impacts to land use would be the approximately 20-year life of the SGP. Following closure and reclamation of the mine, land use would be restored to its current use (except at the TSF and TSF Buttress), with a landscape evident of past mining activity but open for public access for dispersed recreation and access to surrounding areas. Impacts would be localized, long term, and minor to moderate as the NFS lands within the Operations Area Boundary represent a minor portion of the PNF’s 2.3 million acres.

**Access Roads**

During the initial 1- to 2-year construction period, access to the mine site under 2021 MMP would use the Johnson Creek Route until the Burntlog Route is completed. For the remainder of the life of the mine, access would be via the Burntlog Route.

OSV trail opportunities would be maintained during construction through a new temporary groomed OSV trail adjacent to the western side of Johnson Creek Road (CR 10-413) from Landmark to Trout Creek campground. Due to year-round access to the mine site first along Johnson Creek Route during construction and then along the Burntlog Route, an existing, approximately 11-mile groomed OSV route from Warm Lake to Landmark would be closed. In addition, during use of the Johnson Creek Route a 9-mile segment of OSV trail between Trout Creek campground and Wapiti Meadows would be closed. A new public access road would be constructed through the mine site to link the Stibnite Road portion of the McCall-Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) (Figure 2.4-2).

**Existing Roads**

Land use along the Johnson Creek Route, existing segments of the Burntlog Route, and the OSV groomed routes includes roadway uses on private and NFS land. Improvements to existing access roads could indirectly alter land use in areas adjacent to roadways through increased vehicle use and recreational access, beginning during construction.

Temporary closure of the existing 9-mile OSV route from Trout Creek campground to Wapiti Meadows under the 2021 MMP, during use of the Johnson Creek Route while Burntlog Route is constructed, would convert the land use from mainly recreation to mining transportation use for the short term. Impacts land use associated with access roads and OSV trails would be localized, long term, and minor.

**New Roads**

Construction of the new roads under the 2021 MMP would result in a change in use of approximately 341 acres of currently undisturbed NFS a land. The new public access road through the mine site would result
in a land use change of approximately four acres of NFS and private land. The temporary Johnson Creek
groomed OSV trail and Cabin Creek Road groomed OSV trail would result in a change in use of
approximately 15 acres and 21 acres of NFS lands, respectively (Table 4.15-3).

The new segments of Burntlog Route and the public access road through the mine site may be authorized
under either 36 CFR 251 as a special use (if it meets the regulatory criteria) or under 36 CFR 228A as a
part of a plan of operations. The new roadway segments are considered a direct effect to land use,
resulting in a total change of approximately 341 acres of NFS land, including approximately 301 acres for
the Burntlog Route.

The construction and operation of the new road segment for the Burntlog Route would introduce new
motorized access to an area where it currently does not exist. Recreational use and recreational special use
areas adjacent to new roadway segments outside of the Operations Area Boundary could expand due to
increased incidental public access. Collectively, these changes in land use would be considered an indirect
impact. These indirect impacts would be experienced during construction, operation, and closure and
reclamation of the mine site under the 2021 MMP.

The 16-foot wide, groomed OSV trails would introduce 75 acres (30.7 miles) of recreational uses to the
area around Warm Lake (Table 4.15-3). Additionally, near Warm Lake, an approximately 2-acre parking
area would be established west of South Fork Road on FR 474B These new recreational land uses would
be considered a direct impact. Indirect impacts may result if new areas are accessed via these routes. The
duration of these impacts would be during construction and operation of the 2021 MMP, and these
roadways would be reclaimed following closure of the mine site. Impacts to land use from new roads and
OSV trails would be localized, long term, and minor to moderate.

Table 4.15-3  OSV Trails

<table>
<thead>
<tr>
<th>OSV Trail</th>
<th>Length in miles</th>
<th>Acres of Trail¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trout Creek Campground</td>
<td>9.0</td>
<td>17.2</td>
</tr>
<tr>
<td>JCR OSV trail during construction</td>
<td>8.1²</td>
<td>15.8</td>
</tr>
<tr>
<td>JCR OSV trail during operations</td>
<td>7.8²</td>
<td>15.1</td>
</tr>
<tr>
<td>Cabin Creek Road OSV trail</td>
<td>10.8</td>
<td>21.0</td>
</tr>
<tr>
<td>Cabin Creek to JC OSV connector</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Warm Lake area OSV connector</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Parking area to Warm Lake Project Camp OSV Trail</td>
<td>1.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>30.7</td>
<td>75.1</td>
</tr>
</tbody>
</table>

¹ OSV Trail width estimated at 16 feet
² Operations miles/ acres included in total

Utilities

Transmission Lines

The 2021 MMP would include rerouting the transmission line in two locations. Approximately 5.4 miles
of the upgraded transmission line would be rerouted to avoid the Thunder Mountain Estates subdivision,
and approximately 0.9 mile of the upgraded transmission line would be rerouted to use an abandoned railroad grade. Approximately 9 miles of new transmission line would be required for the 2021 MMP from the Johnson Creek substation to the mine site.

**Transmission Line Upgrade**

The upgraded transmission line under the 2021 MMP would impact 373 total acres (Table 4.15-4) by expansion of the ROW from 50 to 100 feet. Approximately 64 miles of transmission line would require upgrading. Transmission line upgrades are assumed to require a total ROW width of 100 feet.

Approximately 192 acres of the transmission line ROW associated with the upgrade would be on NFS lands. IPCo’s existing transmission line, its ROW, and access roads are currently authorized under the BNF special use permit #CAS400128. Upgrading the transmission line would require the BNF to amend the existing IPCo special use permit.

Approximately 139 acres of the transmission line ROW associated with the upgrade would be on private land in Valley County and would be associated with two Valley County land use designations: rural and city areas of impact. Construction of the transmission line upgrade on private land would require a conditional use permit from Valley County.

Approximately 35 acres of the transmission line ROW associated with the upgrade would be on state land. A new or amended easement would be required for the expansion of the ROW width to accommodate the upgraded transmission line. The existing transmission line is authorized to IPCo, and a portion of this ROW intersects State Endowment Lands. The IDL is responsible for granting or modifying the transmission line ROW on state-owned lands, if required.

Approximately 7 acres of the transmission line ROW associated with the upgrade would be on BOR land. Upgrading the transmission line would require the BOR to amend the existing IPCo special use permit.

As the transmission line already exists, expansion of the ROW from 50 feet to 100 feet in width and upgrade of the transmission line would be a localized, long term, and negligible to minor impact to land use.

**New Electric Transmission**

Between the new Johnson Creek Substation and the mine site, approximately 9 miles of new 138-kV transmission line would be constructed. The ROW for the new transmission line would be approximately 100 feet wide. The new ROW corridor is considered a direct effect to land use, changing these areas from undeveloped land to a utility use during construction, operation, and closure and reclamation. The ROW required for the new transmission line segment would disturb approximately 101 acres (assuming a final width of 100 feet) of NFS, private, and state land (Table 4.15-4).

Approximately 88 acres of the new transmission line ROW would be required on NFS lands. The new ROW on NFS land may be authorized under either 36 CFR 251 as a special use (if it meets the regulatory criteria) or under 36 CFR 228A as a part of a plan of operations. Approximately 13 acres of a new ROW on private lands in Valley County would be associated with one Valley County land use designations: rural.
The authorization of a new transmission line ROW would result in a land use change, as lands are converted from undeveloped forest land to a managed ROW. Recreational use and recreational special use areas adjacent to a new ROW could change due to increased access from new maintenance access roads. Changes in land use because of the new transmission line ROW would result in both direct and indirect impacts to land uses under the 2021 MMP. Direct effects to land use would be approximately 101 acres. Indirect impacts would be experienced through the conversion of undeveloped land that is commonly available for recreational, tribal, and other special uses. Impacts would be localized, long term, and minor.

Table 4.15-4 Transmission Line ROWs Required

<table>
<thead>
<tr>
<th>Land Management</th>
<th>Transmission Line ROW (Upgrade)</th>
<th>Transmission Line ROW (New)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>138.8</td>
<td>13.5</td>
</tr>
<tr>
<td>% Private</td>
<td>37%</td>
<td>13%</td>
</tr>
<tr>
<td>State</td>
<td>34.9</td>
<td>0</td>
</tr>
<tr>
<td>% State</td>
<td>9%</td>
<td>0%</td>
</tr>
<tr>
<td>NFS</td>
<td>192.1</td>
<td>87.6</td>
</tr>
<tr>
<td>% NFS</td>
<td>52%</td>
<td>87%</td>
</tr>
<tr>
<td>BOR</td>
<td>7.1</td>
<td>0</td>
</tr>
<tr>
<td>% BOR</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total Area (Acres)</strong></td>
<td><strong>372.9</strong></td>
<td><strong>101.1</strong></td>
</tr>
</tbody>
</table>

Source: Perpetua 2021b

1Subtotals may not add to totals due to rounding.

Electrical Substations

Upgrades to Oxbow, Horse Flat, McCall, and Lake Fork substations would not require any additional land. The Warm Lake Substation upgrade would use an additional 0.3 acres of NFS lands. The Johnson Creek substation would be built near the Johnson Creek airstrip on NFS lands and would provide upgraded electricity to the mine site. The SGLF Scott Valley Substation would be within the footprint of the SGLF, utilizing 0.9 acres of private land. The Thunderbolt Drop Substation would occupy 0.1 acre of NFS land. The Mine Site substation would be constructed at the mine site to step-down voltage for distribution and would be located on private lands (less than 1 acre within the mine site disturbance footprint). The Johnson Creek substation would be on NFS land (1.1 acres during construction, 0.4-acre operations footprint). Construction and operation of the Johnson Creek substation would be managed under a Forest Service Special Use permit. Construction and operation of substations on private land may require a conditional use permit from Valley County. The Cascade switching substation would be located along Warm Lake Road and would utilize 2.6 acres of private land.

Land use would change to accommodate the more industrial land use of the substations. This change in land use is considered a direct impact that would last through construction and operation and would be reclaimed post-closure. Impacts would be localized, long term, and negligible to minor.
**Communication Towers and Repeater Sites**

Under the 2021 MMP, existing communication facilities would be expanded using a two-way, rapid communication system. The existing microwave relay tower on private land to the east of the mine site would be upgraded, but the area of disturbance would not change. The two-way radio system would be supported by a series of repeaters placed on public and private land. To maintain communications along the entire Burntlog Route, 10-foot-tall, VHF radio repeaters on 3-foot by 3-foot concrete pads would be placed near the existing Meadow Creek Lookout and Thunderbolt Lookout communication sites, the new Burntlog Maintenance Facility, and on private parcels at the mine site, as needed. No additional disturbance for equipment installation or access would be required. Additionally, a cell tower would be installed to facilitate safety and emergency communications. The disturbance area for the tower would be approximately 30 feet by 60 feet, including all required equipment, and would be near the Meadow Creek Lookout, on a summit east of Blowout Creek drainage, or near the proposed transmission line alignment upslope of the proposed Hangar Flats pit.

Although these communication sites would have small disturbance footprints (less than 0.1 acre each), they would be considered changes in land use from undeveloped to utility use. This change in land use is considered a direct impact that would last throughout construction and operation. Upon closure of the mine site, any communication facilities would be decommissioned and removed, and the ground would be contoured to blend into surrounding terrain. Impacts would be localized, long term, and negligible to minor.

**Off-site Facilities**

The SGLF would be built on private land along Warm Lake Road and would require approximately 25 acres of disturbance. It would alter land use in this area from undeveloped land to developed land. This change in land use would be considered a direct impact of the 2021 MMP. The duration of these impacts would be the life of the SGP (approximately 20 years), and it would be returned to undeveloped land post-reclamation or sold and repurposed.

The Burntlog Maintenance Facility (3.5 acres) would be near Burntlog Route within the disturbance limits of one of the Burntlog Route borrow sources and would not create additional changes to anticipated land use impacts.

Operation of these facilities on NFS lands may be authorized under either 36 CFR 251 as a special use (if it meets the regulatory criteria) or under 36 CFR 228A as a part of a plan of operations. The off-site facilities would be considered a change in land use from open space to developed land. Following mine closure and reclamation, the Burntlog Maintenance Facility buildings and infrastructure would be removed and the area reclaimed. The SGLF could have a “light industry” post-mining land use in which the facility could be maintained by a third party for future use, meaning the facility, located on private land, would not be reclaimed. A new conditional use permit from Valley County would be required prior to use by any other entity. If there is no further use of the site after a two-year time frame, the structures would be removed and the site reclaimed (Section 2.4.7.11). Impacts would be localized, long-term, and negligible.
4.15.2.3 Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. Other differences from the 2021 MMP would include using Johnson Creek Route throughout the life of the mine and relocating the maintenance facility to a site near Landmark.

Land Management

Under the Johnson Creek Route Alternative, the SGP area would occupy approximately 3,095 acres. Approximately 829 acres (27 percent) would be private lands, including lands owned by Perpetua, and 62 acres (2 percent) would be administered by the State of Idaho. NFS lands would comprise approximately 2,192 acres, or 71 percent, of the disturbance area (1,372 acres on PNF-administered lands and 820 acres on BNF-administered lands). Approximately 12.5 acres (less than 1 percent) would be administered by the BOR. Table 4.15-5 shows land management and acreage by major component.

Table 4.15-5 Johnson Creek Route Alternative Land Management and Acreage by Component

<table>
<thead>
<tr>
<th>Component Subtotal</th>
<th>Private</th>
<th>State</th>
<th>BNF</th>
<th>PNF3</th>
<th>BOR</th>
<th>Total Acre</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site Subtotal1</td>
<td>501</td>
<td>0</td>
<td>0</td>
<td>1,227</td>
<td>0</td>
<td>1,728</td>
<td></td>
</tr>
<tr>
<td>Access Roads Subtotal1</td>
<td>19</td>
<td>0</td>
<td>245</td>
<td>64</td>
<td>0</td>
<td>328</td>
<td></td>
</tr>
<tr>
<td>Utilities Subtotal1</td>
<td>284</td>
<td>62</td>
<td>571</td>
<td>81</td>
<td>12.5</td>
<td>1,011</td>
<td></td>
</tr>
<tr>
<td>Off-site Facilities Subtotal1</td>
<td>24</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Total2</td>
<td>828</td>
<td>62</td>
<td>820</td>
<td>1,372</td>
<td>12.5</td>
<td>3,095</td>
<td></td>
</tr>
</tbody>
</table>

1 Utilities acreages include upgrades to utilities that are part of the Connected Actions.
2 Subtotals may not add to totals due to rounding.
3 Approximately 65 acres associated with surface exploration pads and temporary roads (mine site component) have unknown land management breakdown because the exact locations of these exploration areas are not yet known; however, these are included in the PNF mine site subtotal.

Land Use

Operation Area Boundary

The mine site footprint under the Johnson Creek Route Alternative would occupy approximately 1,728 acres. The Johnson Creek Route Alternative would create approximately 881 acres of new disturbance at the SGP. Mining methods as outlined for the 2021 MMP would not change under the Johnson Creek Route Alternative. The mining claim information for the Johnson Creek Route Alternative is also the same as for the 2021 MMP. The difference in acreage between the Johnson Creek Route Alternative at the mine site is due the size and location of the public access road. Compared to the 2021 MMP, the public access road for the Johnson Creek Route Alternative would need to be wider with less steep grade to accommodate mine traffic and heavy vehicles associated with deliveries to the mine, resulting in a larger acreage.

Impacts to land use and during construction, operation, and post-closure under the Johnson Creek Route Alternative would be the same as those discussed under the 2021 MMP.
Access Roads

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed, and the Johnson Creek Route would be used for access during mine construction, operations, closure, and reclamation. Public access would be provided through the mine site similar to that described in the 2021 MMP, although this road would also carry mine traffic and heavy vehicles associated with deliveries to the mine. The closure of the groomed OSV trail from Trout Creek campground to Wapiti Meadows would persist during mine construction, operation, and closure and reclamation (it would only be closed during construction of the Burntlog Route under the 2021 MMP). The other OSV trails would be the same as described under the 2021 MMP. Access for cell tower and VHF repeater sites in IRAs managed for Backcountry /Restoration would be via helicopter under the Johnson Creek Route Alternative.

Existing Roads

Impacts to land use along the Johnson Creek Route and the OSV trails would be the same as described in the 2021 MMP, except major improvements (i.e., widening and upgrading) to the Johnson Creek Route would impact land use on approximately 175 acres of private and NFS lands. This acreage includes development of borrow sources along the Johnson Creek Route for use in upgrading and maintaining the road throughout the life of the mine.

New Roads

Construction of the new roads under the Johnson Creek Route Alternative would result in a land use change of approximately 217 combined acres on NFS and private land. The new public access road through the SGP would result in a change in use of approximately five acres of NFS and private land.

The new ROW for expansion of the Johnson Creek Route and the public access road may be authorized under either 36 CFR 251 as a special use (if it meets the regulatory criteria) or under 36 CFR 228A as a part of a plan of operations. The new ROW corridor is considered a direct effect to NFS land use.

The OSV trail land use impacts would be the same as the 2021 MMP, except the OSV trail from Trout Creek Campground to Wapiti Meadows would be closed for the life of the SGP, a long-term, localized, minor impact.

The duration of these impacts would last through construction and operation of the Johnson Creek Route Alternative. The new roadway segments would be reclaimed following closure of the mine site, except for the Johnson Creek Route which would remain as improved under the Johnson Creek Route Alternative. Indirect impacts to land uses such as motorized access, recreation, and timber harvests would be the same as those described under the 2021 MMP.

Utilities

Transmission Lines

Impacts from transmission line upgrades and construction of a new segment would be the same as that described for the 2021 MMP.
Electrical Substations

Land use impacts from electrical substations in the Johnson Creek Route Alternative would be the same as those described under the 2021 MMP.

Communication Towers and Repeater Sites

Land use impacts from communication towers and repeater sites would be similar to those described under the 2021 MMP, except the repeater sites would be located along Johnson Creek Route.

Off-site Facilities

Land use impacts from the SGLF would be the same as those described under the 2021 MMP. The Landmark Maintenance Facility would be located west of Landmark on the southern side of Warm Lake Road on approximately 3 acres of NFS land. Operation of this facility on NFS lands may be authorized under either 36 CFR 251 as a special use (if it meets the regulatory criteria) or under 36 CFR 228A as a part of a plan of operations. The off-site facilities would be considered a change in land use from open space to developed land. This change in land use would last through construction and operation and would be returned to open space post-reclamation. Impacts would be localized, long-term, and negligible.

4.15.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Land Use and Land Management.

4.15.4 Irreversible and Irretrievable Commitments of Public Resources

4.15.4.1 Action Alternatives

Land use would be altered permanently in the mine site. An area that has been historically used for mining would, after the closure of the mine and reclamation of the site, no longer be used for mining; this would be considered an irreversible commitment of land use. Areas where specific land uses for the action alternatives would be converted from their original land uses, such as recreational (including special uses), tribal, and timber harvests, to mining uses would be considered an irretrievable commitment of land use, because these areas would not be available for other land uses during the life of the SGP for any of the action alternatives.

4.15.4.2 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. There would be no irretrievable and irreversible commitment of public resources expected under the No Action Alternative.
4.15.5  **Short-term Uses versus Long-term Productivity**

### 4.15.5.1  **Action Alternatives**

Land use would change if either of the action alternatives are implemented. Long-term changes in land use could impact how the area is used for agriculture, fisheries, timber harvests, tribal, recreational, and other uses. However, on reclamation of the action alternatives, it is expected many of the original uses would be restored to areas impacted by the SGP.

### 4.15.5.2  **No Action Alternative**

The SGP would not be implemented, and there would not be any impacts from short-term uses on long-term productivity associated with the No Action Alternative.

### 4.16  **Access and Transportation**

#### 4.16.1  **Impact Definitions and Effects Analysis Indicators and Methodology**

The analysis of effects to access and transportation includes the following issues:

**Issue:** The SGP may affect access to public lands during mine construction, operations, and closure and reclamation.

**Indicator:**
- Number, location, and description of changes in access due to new and improved roadways.

**Issue:** The SGP may change the miles of roads, the amount of use, and types of vehicles on each road.

**Indicators:**
- Miles of new road.
- Change in amount of use.
- Changes in frequency of rail, air, and water transportation.

**Issue:** The SGP may affect public safety on the roads used by mine vehicles during construction, operations, and closure and reclamation activities via traffic incidents and potentially associated spills.

**Indicators:**
- Miles of roads used by mine vehicles.
- Change in traffic volume.
- Change in emergency access.

The impacts definitions for intensity, duration (Forest Service 2012c), and context are provided in Table 4.16-1.

A traffic management plan, which would include details for traffic management including road closures affecting public and mine traffic access, has been drafted (Perpetua 2021e). Details of traffic management for public access on the routes for construction, operations, and closure and reclamation, including
through the Operations Area Boundary are general and would be finalized before the ROD for the SGP is signed. The traffic management plan also describes commitments that would be made in a Road Maintenance Agreement with Valley County. These agreements would include commitments regarding snow removal and wintertime maintenance on Warm Lake Road plus safety measures including frequent removal of snow from catchment areas, designed ditches for holding snow, and installation of delineators.

Static population growth rate was used to analyze the action alternative impacts to access and transportation. Although Valley County assumes four percent population growth throughout the county in its Master Transportation Plan, Valley County is a rural county with land use designations comprised of rural cities, villages, and tourist hubs (Valley County 2008a). Although the population in the area has been growing rapidly and is predicted to continue at a substantial rate, in general, rural areas have been static, and populations are predicted to remain the same or increase at a slower rate (Forest Service 2010a).

Table 4.16-1 Impact Definitions for Access and Transportation

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>Negligible</td>
<td>Effects on traffic conditions and access in the analysis area would either not occur or would be so slight as to not be noticeable. No access restrictions to existing, authorized land uses would occur. There would not be a perceptible impact from traffic generation on current traffic conditions.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Minor</td>
<td>Effects on traffic flows and access would be measurable and may be noticeable but would be small and would not adversely impact traffic conditions. Access to existing land uses would be maintained. Applicant-committed EDFs would effectively minimize impacts to the area transportation network.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Moderate</td>
<td>Effects on traffic flows and access would be measurable and readily apparent but would not exceed state standards. There would be a readily apparent, measurable traffic increase on access roads, but not the paved highways. Additional mitigation measures beyond applicant-committed EDFs may be required to minimize adverse effects on transportation, but such measures likely would be successful.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Major</td>
<td>Effects on traffic flows and access would be measurable and would be readily apparent to all. Mitigation measures beyond applicant-committed EDFs may be required to minimize impacts to transportation, and such measures would have to be monitored to determine their effectiveness.</td>
</tr>
<tr>
<td>Duration</td>
<td>Temporary</td>
<td>Impacts are anticipated to last no longer than 1 year.</td>
</tr>
<tr>
<td>Duration</td>
<td>Short-Term</td>
<td>Impacts would last up to 3 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-Term</td>
<td>Impacts would last longer than 3 years up to 20 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>Impacts would remain after reclamation.</td>
</tr>
<tr>
<td>Context</td>
<td>Localized</td>
<td>Effects on access and transportation would be limited to the analysis area.</td>
</tr>
<tr>
<td>Context</td>
<td>Regional</td>
<td>Effects on traffic safety, access, and transportation would extend beyond the analysis area.</td>
</tr>
</tbody>
</table>

*Intensity* is the severity or levels of magnitude of an impact.  
*Duration* is the length of time an effect would occur.  
*Context* is the effect(s) of an action that must be analyzed within a framework, or within physical or conceptual limits.
4.16.2 Direct and Indirect Effects

4.16.2.1 No Action Alternative

Under the No Action Alternative, no approval would be undertaken for the SGP. Consequently, the current transportation systems would remain as they are under existing conditions and there would not be any SGP-related traffic on the roadways. Traffic associated with the currently authorized Golden Meadows Exploration Project would continue until reclamation is complete. Valley County would continue to maintain the roads under the FRTA easements. Road maintenance activities would include blading and shaping the roadbed, ensuring proper moisture conditions of the road surface, cleaning and repairing drainage facilities, removal of obstructions, dust abatement, and snow removal (Lau 2018).

No direct or indirect effects on access and transportation from SGP-related activities would occur under the No Action Alternative.

4.16.2.2 2021 MMP

Warm Lake Road north of Cascade intersects SH 55, which is a major transportation corridor throughout Valley County. Perpetua would work with the ITD to improve the Warm Lake Road intersection with SH 55 by adding left and right turning lanes. Improvements may include the addition of a northbound right turn lane, a southbound left turn lane, a new southbound through lane or an acceleration lane on SH 55; modified striping to reduce the skew angle to better accommodate heavier vehicles without additional improvements; and relocation of the 35-mph to 50-mph increase in speed limit on SH 55 at Warm Lake Road farther north (Parametrix 2018a). The addition of turning lanes would allow for large trucks carrying equipment and supplies to make turns to/from SH 55 from/onto Warm Lake Road. The improvements also would require approval by Valley County.

The 2021 MMP would need year-round passenger and delivery truck access from the onset of construction through the life of the mine. Warm Lake Road is suitable for this use in its current condition. Wintertime maintenance east of Warm Lake Lodge would be conducted by Perpetua to ensure safe, year-round access to the sole route of ingress/egress to the Operation Area Boundary for all mine support traffic. This would include snow removal and road sanding, as appropriate, to maintain a safe driving surface. Commitments for wintertime maintenance of Warm Lake Road would be documented in a Road Maintenance Agreement with Valley County.

Perpetua wintertime maintenance and use of Warm Lake Road would result in two changes to current traffic conditions, one change would be that Warm Lake Road east of Warm Lake Lodge would not be available as a recreational OSV route from the start of construction through reclamation of the SGP. To replace this recreational use, a dedicated alternative OSV route would be established from the Warm Lake area to Landmark via the Cabin Creek/Trout Creek drainages and adjacent to the Johnson Creek Road. Establishing this replacement OSV route would minimize the interactions between SGP traffic and recreational traffic in the winter. The proposed OSV route is illustrated on Figure 2.4-4. The other change in conditions would be expanded wintertime public vehicle access on Warm Lake Road east of Warm Lake Lodge would commingle SGP and public travel.
Changes to the SH 55 and Warm Lake Road intersection would improve access for large trucks carrying equipment and supplies to the Operation Area Boundary and would facilitate turns from SH 55 onto Warm Lake Road and from Warm Lake Road back onto SH 55. Although the intersection of Warm Lake Road and SH 55 would be a localized, permanent, moderate to major change to the roadway, overall impacts to Warm Lake Road under the 2021 MMP would be localized, long term, and minor to moderate as it is suitable for use by large trucks and equipment in its current condition.

**Construction**

During the initial construction period of the Burntlog Route (approximately 2 to 3 years), mine-related traffic would access the Operations Area Boundary from SH 55, north of the city of Cascade, via Warm Lake Road for approximately 34 miles, then north on Johnson Creek Road for approximately 25 miles to the village of Yellow Pine, and from Yellow Pine east approximately 14 miles to the Operation Area Boundary via the Stibnite Road. The portion of the route that includes Johnson Creek Road and Stibnite Road is known as the Johnson Creek Route.

The Johnson Creek Route (Johnson Creek Road and the Stibnite Road portion of the McCall-Stibnite Road) would be used for year-round access until completion of the Burntlog Route for long-term use during operations. Minor surface improvements (e.g., ditch and culvert repair, adding gravel, winter snow removal, resurfacing if required, and summer dust suppression) would occur on the Johnson Creek Route under the 2021 MMP to reduce sediment runoff and dust generation. However, there would be no road alignment modification or widening of these existing roads along the Johnson Creek Route.

Portions of Johnson Creek Road (i.e., Landmark to Wapiti Meadows) are currently used as a groomed OSV trail during winter and use of the Johnson Creek Route by mine-related construction traffic would conflict with this existing groomed OSV trail. Thus, while the Burntlog Route (described below) is under construction, a temporary 16-foot-wide groomed OSV trail adjacent to Johnson Creek Road between the proposed Cabin Creek Groomed OSV Route and Landmark would be constructed. However, the OSV tail from Trout Creek Campground to Wapiti Meadows would be closed until construction of the Burntlog Route is complete; once mine traffic moves to that route, then the OSV route would return to Johnson Creek Road and would reconnect Landmark with Wapiti Meadows.

Perpetua has an existing agreement with Valley County for maintenance of Johnson Creek and Stibnite roads, appropriate revisions to the road maintenance agreement would be established for use of the Johnson Creek Route as a construction route and to ensure year-round access in accordance with Valley County’s public road easement stipulations. Once construction of the Burntlog Route has been completed (2-3 years), the Johnson Creek Route would no longer be used by mine-related traffic.

Approximately 20 miles of existing Burnt Log Road would be widened and improved and approximately 15 miles of new road connecting to Meadow Creek Lookout Road would be constructed within the first 2 years as part of the Burntlog Route. Approximately 1.3 miles of Meadow Creek Lookout Road and approximately two miles of Thunder Mountain Road would also be upgraded. Improvements on Burnt Log Road are anticipated to be completed from May into November, depending upon road and weather conditions. Until the Burntlog Route construction is completed (by the end of the second year), SGP-related traffic would access the Operations Area Boundary via the Johnson Creek Route (Figure 3.16-1). Perpetua would establish eight borrow sites along the Burntlog Route as needed to meet road construction
and ongoing maintenance throughout the life of the operation and through closure and reclamation. Signs warning of construction activities would be placed along Burntlog Route.

The Burntlog Route would connect the eastern end of Warm Lake Road (at Landmark) to the Operations Area Boundary (to the northeast) by widening and improving approximately 23 miles of existing roads, including the full length of the existing Burnt Log Road and segments of Meadow Creek Lookout Road and Thunder Mountain Road. The three road segments would be connected with two new road segments totaling approximately 15 miles. Burnt Log Road is currently a native surface road that is open year-round to all vehicles with seasonal restrictions due to snow. The last 0.25 to 0.5 mile of the existing road is closed and motorized traffic prohibited. Meadow Creek Lookout Road is a native surface road, open year-round to all vehicles. The Burntlog Route is primarily situated topographically on mid-slopes and ridgeline.

A segment of new road construction for the Burntlog Route would be located on the south side of the Riordan Creek drainage and cross Riordan Creek north of Black Lake. The approximately 5.3-mile road segment would have 12 stream crossings, three of which cross perennial streams. After construction is completed, public use would be allowed on Burntlog Route when other public access roads are blocked by mine operations.

The connection segment between the end of Burnt Log Road and Meadow Creek Lookout Road is approximately 11 miles and would cross Trapper Creek 0.5 miles east of the intersection of Trapper Creek Road and FR 440A and continue northeast towards Black Lake and on to the Meadow Creek Lookout Road. The second connector between the Meadow Creek Lookout Road and Thunder Mountain Road would be approximately 4 miles and links up with Thunder Mountain Road approximately 2 miles south of the SGP. Minor surface improvements (e.g., blading) would occur on the existing Thunder Mountain Road and Meadow Creek Lookout Road to provide a safe road surface for transportation of construction equipment required to build the Burntlog Route. There would be no road alignment modification or widening of the existing roads.

Primary Operation Area Boundary access would shift from the Johnson Creek Route to the Burntlog Route near the end of the construction phase. The Burntlog Route would be compliant with all related usage and approval requirements included in 36 CFR Section 228, Part A, but may also be approved under 36 CFR 251 as a special use if it meets the regulatory criteria. The Burntlog Route would avoid environmental and human health and safety risks associated with the Johnson Creek Route which passes through identified areas for avalanches, landslides, and floods. This route would provide another route for Operations Area Boundary ingress/egress, would decrease SGP and public traffic interaction with Yellow Pine and Johnson Creek area residents, and would decrease the potential for spill risk adjacent to fish-bearing streams. Upon completion, the Burntlog Route would serve as an alternative public access route to the Thunder Mountain area for the life of the mine until it is decommissioned following mine reclamation and closure.

While the Johnson Creek Route is in use, Perpetua would coordinate with Valley County on the use and maintenance of the route for year-round access in accordance with Valley County’s public road FRTA easement stipulations. Impacts to access and transportation from construction would be localized, short term, and minor to major. Major impacts would be primarily associated with the mobilization of materials
and equipment to commence facility construction activities and the road improvement and construction activities for construction of the Burntlog Route.

Traffic Volumes

Table 4.16-2 shows the existing and 2021 MMP AADT for the public roads used during construction. Traffic volumes associated with the 2021 MMP construction would increase approximately 93 percent on Johnson Creek Road and approximately 216 percent on the Stibnite Road portion of McCall-Stibnite Road from Yellow Pine to the Operations Area Boundary. Over a third of the vehicles traveling on these one-lane, native surfaced roads would be comprised of heavy vehicles and would result in slower travel times for non-mine-related traffic and may deter travelers from using these roadways. Travelers may use alternative roadways, including McCall-Stibnite Road and SFSR Road, to access the village of Yellow Pine. Traffic volumes on Burnt Log Road also would increase from existing conditions due to the construction of the Burntlog Route. The roadways that are currently more traveled would have a less noticeable increase in daily traffic; Warm Lake Road traffic would increase by 11.9 percent and SH 55 traffic would increase by only 4.0 percent. Heavy vehicles would comprise less than 2 percent of the total traffic on these two roadways; however, due to the one-lane constraints on both roadways, non-mine-related vehicles may experience slower travel times.

Additionally, reconstruction of the transmission line to the SGP could overlap with the 2021 MMP construction traffic. Construction would occur along the existing alignment and construction crews would be separated throughout the SGP area to minimize construction traffic (HDR 2017o). Reconstruction of the transmission line along Warm Lake Road and Johnson Creek Road to the Operations Area Boundary is estimated to occur in the third and fourth years of construction and would overlap at the end of the 2021 MMP construction period. Therefore, traffic interruption and delays associated with the reconstruction of the transmission line would increase overall SGP-related traffic on Warm Lake and Johnson Creek roads. Reconstruction of the transmission line is planned to occur at several facilities and construction crews would be spread throughout the SGP, which would reduce associated construction traffic.

Table 4.16-2 Existing and 2021 MMP Construction AADT

<table>
<thead>
<tr>
<th>Name</th>
<th>Existing AADT¹</th>
<th>Construction AADT (% Increase from Existing) SH 55 to SGLF</th>
<th>% Heavy Vehicles² SH 55 to SGLF</th>
<th>Construction AADT (% Increase from Existing) SGLF to SGP</th>
<th>% Heavy Vehicles² SGLF to SGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGP-related AADT</td>
<td>n/a</td>
<td>198</td>
<td>15</td>
<td>65</td>
<td>69.2</td>
</tr>
<tr>
<td>SH 55</td>
<td>4,900</td>
<td>5,135 (4.0)</td>
<td>0.6</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>1,670</td>
<td>1,868 (11.9)</td>
<td>1.6</td>
<td>1,735 (3.9)</td>
<td>2.6</td>
</tr>
<tr>
<td>Johnson Creek Road</td>
<td>70</td>
<td>n/a</td>
<td>n/a</td>
<td>135 (93%)</td>
<td>33.3</td>
</tr>
<tr>
<td>Name</td>
<td>Existing AADT(^1)</td>
<td>Construction AADT (% Increase from Existing) SH 55 to SGLF</td>
<td>% Heavy Vehicles(^2) SH 55 to SGLF</td>
<td>Construction AADT (% Increase from Existing) SGLF to SGP</td>
<td>% Heavy Vehicles(^2) SGLF to SGP</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------------</td>
<td>-------------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Stibnite Road (village of Yellow Pine to SGP)</td>
<td>30</td>
<td>n/a</td>
<td>n/a</td>
<td>95 (216%)</td>
<td>47.4</td>
</tr>
<tr>
<td>Burnt Log Road</td>
<td>70</td>
<td>n/a</td>
<td>n/a</td>
<td>703</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: HDR 2017l, 2017m; ITD 2017, 2019; Perpetua 2021a

\(^1\)Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

\(^2\)The approximate minimum percentage of SGP-related heavy vehicles occurring on the roads.

\(^3\)Traffic volumes on Burnt Log Road are anticipated to peak at 50 AADT during the operations phase.

There is a seasonal effect of traffic on these roads. Valley County has many summer recreational areas that attract visitors from May through October with peak AADT levels in June, July, and August. Winter weather and driving conditions influence the amount of traffic and result in less AADT during the winter months. Therefore, the seasonal effect of traffic on these roads would show a noticeably greater increase in mine-related winter traffic (i.e., drivers would notice a higher ratio of mine-related traffic to general traffic). The increase in traffic from Warm Lake Road east of the SGLF and over Big Creek summit which includes the Warm Lake recreational area could pose additional risk to the occasional pedestrian or bicyclist in this area.

Perpetua would limit their vehicle traffic outside the Operations Area Boundary to between 5:00 am and 7:00 pm everyday resulting in approximately five mine-related vehicles traveling on the Johnson Creek Route per hour during the 2 years the Burntlog Route is constructed. Non-mine-related vehicles may experience slower travel times as mine-related vehicle transport would occur during the morning and evening peak hours and typical commute or travel times. However, once construction of Burntlog Route is completed, the Johnson Creek Route would no longer be used by mine-related traffic, and the AADT on Johnson Creek and Stibnite Road would return to the baseline AADT traffic volume.

Impacts to traffic volumes during construction would be localized, short-term, and minor to major. Major impacts would be associated primarily with the mobilization of materials and equipment to commence facility construction projects.

**Public Access**

During construction, the public would continue to have access to the PNF and BNF on NFS roads currently available to the public, including along Johnson Creek Road, Burnt Log Road, and through the SGP on Stibnite Road connecting to Thunder Mountain Road. Road closures from half-day to multiple days may occur during construction on Stibnite Road between the village of Yellow Pine and the Operations Area Boundary, part of Thunder Mountain Road, and Burnt Log Road. Periodic lane restrictions and appropriate signage would be posted to notify travelers of construction activities.
During construction, public access through the Operations Area Boundary on Stibnite Road would be restricted for 1 year or more while a new 4-mile-long, 12-foot-wide gravel road is constructed to provide public access from Stibnite Road (FR 50412) to Thunder Mountain Road (FR 50375).

The through-SGP public access road would provide seasonal access, similar to current conditions. During operations, public access through the SGP would be provided during the snow-free season to all vehicle types. Vehicles passing through the SGP would be required to check-in with mine personnel at the North or South SGP entry points to receive a safety briefing and would also be required to check-out with mine site personnel upon exiting the SGP. For safety purposes, no stopping or deviating from the public access road would be allowed. Operations Area Boundary access would be restricted during road construction and maintenance, blasting, highwall scaling, mining in the immediate area of the road, and similar operations.

Public access would be separated from other SGP roads by berms, security fencing, and an underpass to allow the public road to pass beneath the mine haul road. The public access road would not be plowed in the winter (current county maintenance standards) and static and electronic signage and automated timed stoplights would be present at points of public access to inform the public of seasonal and temporary closures.

The newly constructed Burntlog Route connecting to Thunder Mountain Road would be a temporary road necessary for mining purposes and would meet 36 CFR 228A requirements for environmental protection to assume that mine operations are conducted to minimize adverse environmental impacts to the extent feasible for roads. Accordingly, the road would not be designated for public motor vehicle use under 36 CFR 212.50 on the Motor Vehicle Use Map. Therefore, for public motor vehicle use to be allowed on the road when other public access roads are blocked by mine operations, one of the other exceptions from the prohibitions on motor vehicle use on NFS land at 36 CFR 261.13 must be met. The approved plan of operations would meet the exception for written Forest Service authorization under 36 CFR 261.13(h) by including a provision in the mine plan for public use of the road when other public road access is blocked by mine operations.

Impacts to public access during construction would be localized, short-term, and minor to major. Major impacts would generally be associated with road construction and non-standard maintenance activities plus the mobilization of equipment resulting in over-sized loads.

**Operations**

**Traffic Volumes**

Upon completion of Burntlog Route, mine vehicles would travel approximately 71 miles from the intersection of Warm Lake Road and SH 55 to the Operation Area Boundary. Approximately 13.5 miles of new private access roads would be created during the life of the mine. No new NFS roads would be created during the life of the mine. **Table 4.16-3** shows the existing and 2021 MMP AADT for the main roadway segments in the access and transportation analysis area during operations.
## Table 4.16-3  Existing and 2021 MMP Operations AADT

<table>
<thead>
<tr>
<th>Name</th>
<th>Existing AADT¹</th>
<th>Operations AADT (% Increase from Existing)</th>
<th>% Heavy Vehicles²</th>
<th>Operations AADT (% Increase from Existing)</th>
<th>% Heavy Vehicles²</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGP-related AADT</td>
<td>n/a</td>
<td>156 (16.0%)</td>
<td>50 (66%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SH 55</td>
<td>4,900</td>
<td>5,056 (3.2%)</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>1,670</td>
<td>1,826 (9.3%)</td>
<td>1.4 (1.5%)</td>
<td>1,720 (3.0%)</td>
<td></td>
</tr>
<tr>
<td>Johnson Creek Road</td>
<td>70</td>
<td>n/a</td>
<td>n/a</td>
<td>70 (0%)</td>
<td></td>
</tr>
<tr>
<td>Stibnite Road (village of Yellow Pine to SGP)</td>
<td>30</td>
<td>n/a</td>
<td>n/a</td>
<td>30 (0%)</td>
<td></td>
</tr>
<tr>
<td>Burnt Log Road</td>
<td>70</td>
<td>n/a</td>
<td>120 (71.4%)</td>
<td>27.5</td>
<td></td>
</tr>
</tbody>
</table>

Source: HDR 2017l, 2017m; ITD 2017, 2019; Perpetua 2021a

¹Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

²The approximate minimum percentage of SGP-related heavy vehicles occurring on the roads.

Traffic volumes associated with the 2021 MMP operations would increase traffic on the Burntlog Route. Specifically, the upgraded Burnt Log Road section of the Burntlog Route would experience a traffic increase of approximately 71.4 percent with approximately 27.5 percent of traffic comprised of heavy vehicles. Overall, there would be less mine-related traffic on the road during operations than during construction; however, the driver experience would still be noticeably different than existing conditions with an increase in mine-related heavy vehicles and slower travel times. The roadways currently more traveled would have a less noticeable increase in daily traffic; Warm Lake Road traffic would increase by 9.3 percent and SH 55 traffic would increase by about 3.2 percent. Perpetua would limit their vehicle traffic outside the Operations Area Boundary to between 5:00 am and 7:00 pm, resulting in approximately four mine-related vehicles traveling on the Burntlog Route per hour. Winter driving conditions influence the amount of traffic and typically result in less AADT. Therefore, the seasonal effect of traffic on these roads would show a noticeably greater increase in mine-related winter traffic (i.e., drivers would notice a higher ratio of mine-related traffic to general traffic). Traffic on Johnson Creek Road and Stibnite Road would return to local and recreation traffic only and baseline AADTs. Similar to traffic increases along Warm Lake Road during construction, the increase in traffic from Warm Lake Road east of the SGLF and over Big Creek summit which includes the Warm Lake recreational area during operations could pose additional risk to the occasional pedestrian or bicyclist in this area.

Impacts to traffic volume on existing roadways during operations would be localized, long-term, and minor to major. Major impacts would be associated primarily with the mobilization of materials and equipment to commence facility construction projects.
Public Access

Public access within the analysis area would be the same as construction once the public access road through the SGP from Stibnite Road to Thunder Mountain Road, was complete. Approximately 13.5 miles of new roads managed by Perpetua, but open to controlled public access, would be created.

There are tribal concerns regarding continued access to usual and accustomed places in which tribes exercise their treaty rights. Currently, there are no tribal access restrictions on the Forest Service lands in the SFSR watershed. There would be a long-term loss of access to land for exercising treaty rights within the Operations Area Boundary while the lands are occupied for mining; however, lands within the Operations Area Boundary have been highly disturbed by past mining activities. Further details on the impacts to Tribal treaty rights and land access are discussed in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q) and Section 4.24. Impacts to public access during operations would be localized, long term, and minor.

Closure and Reclamation

Mine closure and reclamation activities of recontouring slopes, removing facilities, seeding, and planting areas under the 2021 MMP would require approximately 5 to 7 years during which all access roads to the Operations Area Boundary would be maintained. Any newly constructed roads within the mine operations area would be closed for any long-term use.

The Burntlog Route would be needed until the disturbed area is reclaimed at the SGP. After reclamation work is completed, the Burntlog Route would be decommissioned, and the existing upgraded sections of Burnt Log Road would be narrowed to their pre-mining widths while the new roadway portion of the Burntlog Route would be completely removed and reclaimed. Once all final mine closure, reclamation, and related environmental closure monitoring work has been completed, the 20-foot roadway width of 20 miles of Burnt Log Road, 1.3 miles of Meadow Creek Lookout Road, and 2 miles along Thunder Mountain Road of the upgraded portion of Burntlog Route would be reduced to their approximate pre-mining width of approximately 12 feet.

Monitoring of all facilities and disturbance areas would be conducted following the completion of closure and reclamation to demonstrate compliance with permit requirements and to measure the success of reclamation. Reclamation success monitoring such as erosion and sediment control monitoring would be completed per the Reclamation and Closure Plan upon Forest Service approval. Overall, impacts to access and transportation from closure and reclamation would be localized, short term to long term, and negligible to minor.

Traffic Volumes

Table 4.16-4 shows the existing and 2021 MMP AADT for the main roadway segments in the access and transportation analysis area during closure and reclamation. Traffic volumes associated with the 2021 MMP closure and reclamation would increase traffic on the roads associated with Burntlog Route over existing conditions. Specifically, the upgraded Burnt Log Road section of the Burntlog Route would experience a traffic increase of approximately 38.6 percent, but this would be close to half the traffic of operations. About 15.5 percent of the vehicles traveling this one-lane, native-surfaced road would be heavy vehicles that could result in slower travel times for non-mine-related traffic and may deter travelers...
from using this roadway. Perpetua would limit their vehicle traffic outside the Operations Area Boundary to between 5:00 am and 7:00 pm resulting in approximately two mine-related vehicles traveling on the Burntlog Route per hour during closure and reclamation. The more traveled roadways would have a less noticeable change in daily traffic; Warm Lake Road and SH 55 traffic would increase by 1.6 percent or less. Heavy vehicles would comprise less than one percent of the total traffic on these two roadways during closure and reclamation; however, due to the one-lane constraints on both roadways, non-mine-related vehicles may experience slower travel times.

Table 4.16-4 Existing and 2021 MMP Closure and Reclamation AADT

<table>
<thead>
<tr>
<th>Name</th>
<th>Existing AADT</th>
<th>Closure and Reclamation AADT (% Increase from Existing)</th>
<th>% Heavy Vehicles</th>
<th>Post-Closure AADT (% Increase from Existing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGP-related AADT</td>
<td>n/a</td>
<td>27</td>
<td>56</td>
<td>6</td>
</tr>
<tr>
<td>SH 55</td>
<td>4,900</td>
<td>4,927 (0.6%)</td>
<td>0.3</td>
<td>4,906 (0.1%)</td>
</tr>
<tr>
<td>Warm Lake Road (CR 10-579)</td>
<td>1,670</td>
<td>1,697 (1.6%)</td>
<td>0.9</td>
<td>1,676 (0.5%)</td>
</tr>
<tr>
<td>Johnson Creek Road (CR 10-413)</td>
<td>70</td>
<td>70 (0%)</td>
<td>-</td>
<td>76 (8.6%)</td>
</tr>
<tr>
<td>Stibnite Road (village of Yellow Pine to SGP)</td>
<td>30</td>
<td>30 (0%)</td>
<td>-</td>
<td>36 (20%)</td>
</tr>
<tr>
<td>Burnt Log Road (FR 447)</td>
<td>70</td>
<td>97 (38.6)</td>
<td>15.5</td>
<td>70 (0%)</td>
</tr>
</tbody>
</table>

Source: HDR 2017l, 2017m; ITD 2017, 2019; Perpetua 2021a

1Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

2The approximate minimum percentage of SGP-related heavy vehicles occurring on the roads.

Closure and reclamation traffic impacts during the winter would be the same as those discussed under construction and operations. Post-closure winter traffic would not be as noticeable, as closure and reclamation traffic heavy vehicle deliveries would not occur, and approximately six mine-related vehicles per day would utilize the accessible roadways in the analysis area for monitoring and maintenance purposes. Impacts to traffic volumes during closure and reclamation would be localized, short-term, and minor.

Public Access

Public access during the closure and reclamation phase would be coordinated with the Forest Service and would involve establishing a permanent service road through the backfilled Yellow Pine pit for public access through the Operations Area Boundary for dispersed recreation uses connecting to Thunder Mountain Road. This would result in a total of approximately 2.2 additional miles of new road that would be accessible for public use following reclamation. Post-closure public access would require revision to the existing FRTA easement with Valley County regarding road maintenance. Impacts to public access during closure and reclamation would be localized, long-term, and negligible.
Safety and Emergency Access

For the duration of the 2021 MMP, the increase in total volume of mine-related vehicles, specifically heavy vehicles or trucks, on the Johnson Creek and Burntlog Routes would result in a greater safety risk for accidents occurring between vehicles due to degradation of the road with more frequent heavy vehicle travel and the one-lane constraints (i.e., no passing lane) that restrict the passing of slower moving vehicles. Mine-related traffic on Warm Lake Road would increase by approximately 11 percent during construction activities and nine percent during operation activities, and traffic volume on construction access (Johnson Creek Road and Stibnite Road) and then operational access (Burntlog Route) would increase substantially (Tables 4.16-2 and 4.16-3). More vehicles would be present on Warm Lake Road to the SGLF, where most vehicles would park and employees would be bussed from there to the Operations Area Boundary. Even with the traffic management and safety controls implemented (Section 2.4.9), accident rates could increase with additional road usage along with associated transportation-related spills. The procedures outlined in the Emergency Response Plan would be followed to protect the environment, the health of employees and the general public, and to comply with federal and state regulations.

Burnt Log Road would be widened to 26 feet (including 3-foot vegetated shoulders), tight corners would be straightened to allow for improved safety and traffic visibility, grades would be maintained at less than 10 percent in all practicable locations, and placement of sub-base material and surface with gravel would occur to provide a stable long-term roadway and reduce sediment. Side-ditching, culverts, guardrails, and bridges would be installed where necessary. During winter road maintenance, snow would be removed from the Burntlog Route plus its temporary construction access, haul roads at the SGP, and the Johnson Creek Route. Although no road alignment modification or widening would occur to Johnson Creek Road and Stibnite Road as part of the Johnson Creek Route under the 2021 MMP, upgrades, including minor surface improvements (e.g., adding gravel, winter snow removal, and summer dust suppression), would occur to reduce dust generation from vehicles, indirectly improving visibility, and support safer road conditions.

Pilot cars would be used during oversized equipment mobilization and demobilization along the Burntlog Route and portions of the Johnson Creek Route, as needed, to control speed and reduce potential for conflicts or incidents along these narrow access roads leading into the Operations Area Boundary.

The increased heavy vehicle traffic would degrade the existing and proposed transportation system over the duration of the SGP. However, maintenance measures authorized under a cooperative agreement with Valley County and the Forest Service would be performed to repair segments that have deteriorated over time. The continued maintenance and improvements of the road system would help reduce dust and maintain public safety for the duration of the SGP.

Access for emergency response would be maintained throughout the analysis area. Emergency access would be provided on the Johnson Creek Route during the first 2 years of construction and then on Burntlog Route for the remainder of the SGP. In the event of an emergency where road closure would facilitate response or when a threat to human life is identified (e.g., fires), roads would be temporarily closed, as appropriate. In addition, there would be access for helicopters at the maintained helipad at the SGP.
Measures would be implemented that would help reduce the incidence of accidents, including busing and/or van pooling to the Operations Area Boundary, housing workers at the Operations Area Boundary to minimize the frequency of SGP worker vehicle trips, driver training (e.g., use of truck compression brakes on steep sections and along areas where residences are located and familiarity with the travel routes including locations of steep slopes that require downshifting), and equipping staff traveling to and from the Operations Area Boundary with two-way radios to communicate positions, relay information about road conditions, and warn of public vehicles traveling on the Burntlog Route (or Johnson Creek Route during construction). This also would allow for rapid response in the event of an accident.

Perpetua would adhere to EDFs (Section 2.4.9), Forest Service-required measures, and permit stipulations, including, but not limited to: ensuring drivers and airplane/helicopter pilots are appropriately licensed; annual inspections of transport vehicles; observing county and state speed limits, road restrictions (e.g., use of tire chains for snow or icy road conditions), and load limits; and coordination with Forest Service (and Valley County as appropriate) on air and road operations to further reduce the incidence of accidents.

The public access route through the Operations Area Boundary would separate public traffic from mine traffic on the road through the SGP thereby reducing potential safety issues.

Safety and emergency access impacts from the SGP would be localized, long-term, and negligible to major. Major impacts would be associated with the roads with largest increases in usage compared to existing conditions, primarily the mine access route upon departing the Warm Lake Road.

**Other Modes of Transportation**

**Air Transportation** - Under the 2021 MMP, a helipad would be maintained in an area at the SGP adjacent to the administration offices and warehouse facilities for exploration and Medevac purposes. Helicopters would be used to deliver drill rigs and supplies for remote surface exploration drilling activities on an as needed basis when truck or crawler mounted rigs would be unable to reach the drill site. Helicopter support would only occur during daylight hours. The new substation at Johnson Creek would not impact air traffic use of the Johnson Creek airstrip. Overall air traffic associated with the 2021 MMP would be intermittent, localized, and generate negligible changes in air traffic patterns.

**Water Transportation** - Under the 2021 MMP, approximately one round trip (two truck trips) of antimony concentrate would be hauled off-site daily in locked shipping containers for shipping out of the area. The Port of Lewiston would be the closest port for transport by commercial barge. The daily shipment of antimony and the potential indirect transport of supplies and materials to and from the Operations Area Boundary would generate minimal to negligible changes in water transportation. The addition of associated impacts to transport by commercial barge from the Port of Lewiston to and from distributors, purchasers, and refineries under the 2021 MMP would be regional, long-term, and negligible, and would blend into the typical traffic associated with this type of goods movement.

**Rail Transportation** - There are no rail transportation systems in the analysis area. However, there is a potential for trucks to transport antimony concentrate to rail lines located in Boise. Additionally, supplies and materials may be indirectly transported to and from the SGP by trucks originating from rail shipments. Nevertheless, these impacts would generate negligible changes to rail transport during
operation of the 2021 MMP and would not substantially alter the level of service for this mode of transportation.

4.16.2.3 Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the Johnson Creek Route would be used to access the SGP during all phases, and the Burntlog Route would not be constructed. Mine vehicles would travel approximately 70 miles from the intersection of Warm Lake Road and SH 55 to Johnson Creek Road and Stibnite Road to the Operations Area Boundary. Road widening and straightening, along with drainage and bridge improvements would be required for the Johnson Creek Road portion of the Johnson Creek Route. The Stibnite Road portion would be improved by straightening curves, bridge improvements, constructing retaining walls, and installing culverts. In addition, the Stibnite Road portion would be improved by widening curves to accommodate 55-foot semi-truck trailers. Approximately 1 mile of road through the village of Yellow Pine would be paved. Construction and improvements to the Johnson Creek Route would require approximately 4 years with a total construction schedule for the SGP of 5 years (2 years more than the Burntlog Route). Only impacts that differ from the 2021 MMP are discussed below.

Construction

Improvements on the Johnson Creek Route would be completed from May into November annually, depending upon road and weather conditions. During the first year of construction, upgrades to Johnson Creek Road would require periodic full road closure throughout the entire season. During years two through four, the Stibnite Road segment would be upgraded. Tight terrain and rock blasting would require daily, full-road closures between 10 am and 4 pm, with the road open for public use each morning and night. The delay in road construction results in a delay to bring in appropriate equipment and materials to complete mine construction which would then occur during year five of construction. Seven aggregate sources along the Johnson Creek Route for construction and maintenance have been identified (Figure 3.16-1) with an estimated disturbance of 109 acres.

The portion of Burntlog Route that would connect with Thunder Mountain Road and continue toward the Worker Housing Facility toward the southeast of the SGP would not be plowed in the winter and would not be accessible to the public. During construction, winter snow removal and summer dust suppression would occur under the Johnson Creek Route Alternative, including on Johnson Creek Road. Public access on Johnson Creek Road would be completely restricted for one full year during the first year of construction of the Johnson Creek Route Alternative with improvements to Johnson Creek Road. Impacts to access and transportation from construction would be localized, short term, and minor to major.

Traffic Volume

Traffic volume impacts under the Johnson Creek Route Alternative would be the same as those described under the 2021 MMP for construction (Table 4.16-2) as they use the same route. However, the construction phase would be 2 years longer than under the 2021 MMP so construction related traffic impacts would be longer in duration. During road closures, local area residents would need to use SH 55 to Warren Wagon Road then to Warren-Profile Gap Road to access the Edwardsburg/Big Creek area. Impacts to traffic volumes during construction would be localized, short-term, and minor to major.
**Public Access**

The public would share the Johnson Creek Route with mine-related traffic through construction, operations, and closure and reclamation on Johnson Creek Road and Stibnite Road. During road closures, if there is no alternative route available, the public would be precluded from accessing certain areas during the closure, such as recreational areas along Johnson Creek. Impacts to public access during construction would be localized, short-term, and minor to major.

**Operations**

Mine-related traffic would include transport of employees to and from the Operations Area Boundary, delivery of supplies, antimony concentrate trucks, and activities associated with road maintenance such as grading, snowplowing, and sanding. Supplies and deliveries for the SGP during construction, operations, and closure and reclamation would use SH 55 to Warm Lake Road to access the SGLF. An estimated two-thirds of all mine related traffic would originate south of Warm Lake Road on SH 55 and the other third of mine-related traffic would originate from the north.

**Traffic Volume**

Under the Johnson Creek Route Alternative, mine-related traffic would use the Johnson Creek Route for the duration of the SGP. Public traffic and mine traffic would share the road from Landmark to the Operations Area Boundary. Mine vehicles would travel approximately 70 miles from the intersection of Warm Lake Road and SH 55 to the Operations Area Boundary. No new private access roads or NFS roads would be created under the Johnson Creek Route Alternative. **Table 4.16-5** shows the existing and Johnson Creek Route Alternative AADT for the main roadway segments in the access and transportation analysis area during operations.

**Table 4.16-5 Existing and Johnson Creek Route Alternative Operations AADT**

<table>
<thead>
<tr>
<th>Name</th>
<th>Existing AADT¹</th>
<th>Operations AADT (% Increase from Existing) SH 55 to SGLF</th>
<th>% Heavy Vehicles² SH 55 to SGLF</th>
<th>Operations AADT (% Increase from Existing) SGLF to SGP</th>
<th>% Heavy Vehicles² SGLF to SGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGP-related AADT</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SH 55</td>
<td>4,900</td>
<td>5,056 (3.2%)</td>
<td>0.5</td>
<td>50</td>
<td>66</td>
</tr>
<tr>
<td>Warm Lake Road</td>
<td>1,670</td>
<td>1,826 (9.3%)</td>
<td>1.4</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Johnson Creek Road</td>
<td>70</td>
<td>n/a</td>
<td>n/a</td>
<td>120 (71.4%)</td>
<td>27.5</td>
</tr>
<tr>
<td>Stibnite Road (village of Yellow Pine to SGP)</td>
<td>30</td>
<td>n/a</td>
<td>n/a</td>
<td>80 (166.7%)</td>
<td>41.3</td>
</tr>
</tbody>
</table>

Source: HDR 2017i, 2017m; ITD 2017, 2019

¹Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

²The approximate minimum percentage of SGP-related heavy vehicles occurring on the roads.
Operations under the Johnson Creek Route Alternative would result in increased traffic volumes on the Johnson Creek Route. Specifically, traffic on Johnson Creek Road and Stibnite Road would increase approximately 71 percent (27.5 percent heavy vehicles) and 167 percent (41 percent heavy vehicles), respectively. Heavy vehicles currently use the Johnson Creek Route to access the Operations Area Boundary in the summer; however, the Johnson Creek Route Alternative operational traffic would result in a noticeable change in baseline driver experience and slower drive times on the Johnson Creek Route due to the substantial increase in mine-related vehicles. Even though Johnson Creek Road would be upgraded under the Johnson Creek Route Alternative, the road would still have many curves and slopes, thus requiring slow speeds.

The more traveled roadways would have a less noticeable increase in daily traffic; Warm Lake Road traffic would increase by approximately 9.3 percent and SH 55 traffic would increase by 3 percent. Perpetua would limit their vehicle traffic outside the Operations Area Boundary to between 5:00 am and 7:00 pm, resulting in approximately four mine-related vehicles traveling on the Johnson Creek Route per hour. Impacts to traffic volume during operations would be localized, long-term, and major.

Public Access

Public access through the Operations Area Boundary during operations would be similar to the 2021 MMP. Impacts to Tribal land access would be the same as under the 2021 MMP, except the Burntlog Route would not be constructed. Further details on the impacts to Tribal treaty rights and land access are discussed in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q) and Section 4.24. Impacts to public access during operations would be localized, long-term, and minor.

Closure and Reclamation

Traffic Volume

Traffic volume impacts under the Johnson Creek Route Alternative would be similar to those described under the 2021 MMP for closure and reclamation, except instead of the Burntlog Route, mine-related traffic would use the Johnson Creek Route during closure, reclamation, and post-closure activities. Table 4.16-6 shows the existing and the Johnson Creek Route Alternative AADT for the main roadway segments in the access and transportation analysis area during closure and reclamation.

As shown in Table 4.16-6, traffic volumes associated with the Johnson Creek Route Alternative closure and reclamation would increase current volumes for the Johnson Creek Route. Specifically, traffic on Johnson Creek Road and Stibnite Road would increase approximately 38.6 percent (approximately 15.5 percent heavy vehicles) and 90 percent (approximately 26 percent heavy vehicles), respectively. Closure and reclamation mine-related traffic would be less than operational traffic with 27 AADT for closure and reclamation versus 50 AADT for operations. The driver experience would still include some heavy vehicles that result in slower drive times, but heavy vehicles would eventually decrease to one or none daily as closure and reclamation is completed. The roadways currently more traveled would have a less noticeable increase in daily traffic; Warm Lake Road traffic would increase by 1.6 percent and SH 55 traffic would only increase by 0.6 percent. Perpetua would limit their vehicle traffic outside the SGP to between 5:00 am and 7:00 pm, resulting in approximately two mine-related vehicles traveling on the Johnson Creek Route per hour during closure/reclamation. Post-reclamation mine-related traffic would
consist of 6 light vehicles on these roads (Table 4.16-6). Impacts to traffic volume during closure and reclamation would be localized, long term, and negligible to minor.

Table 4.16-6  Existing and Johnson Creek Route Alternative Closure and Reclamation AADT

<table>
<thead>
<tr>
<th>Name</th>
<th>Existing AADT</th>
<th>Closure and Reclamation AADT (% Increase from Existing)</th>
<th>% Heavy Vehicles</th>
<th>Post-Closure AADT (% Increase from Existing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGP-related AADT</td>
<td>n/a</td>
<td>27</td>
<td>55.6</td>
<td>6</td>
</tr>
<tr>
<td>SH 55</td>
<td>4,900</td>
<td>4,927 (0.6%)</td>
<td>0.3</td>
<td>4,906 (0.1%)</td>
</tr>
<tr>
<td>Warm Lake Road (CR 10-579)</td>
<td>1,670</td>
<td>1,698 (1.6%)</td>
<td>0.9</td>
<td>1,676 (0.4%)</td>
</tr>
<tr>
<td>Johnson Creek Road (CR 10-413)</td>
<td>70</td>
<td>97 (38.6%)</td>
<td>15.5</td>
<td>77 (8.6%)</td>
</tr>
<tr>
<td>Stibnite Road (village of Yellow Pine to SGP)</td>
<td>30</td>
<td>57 (90.0%)</td>
<td>26.3</td>
<td>36 (20.0%)</td>
</tr>
<tr>
<td>Burnt Log Road (FR 447)</td>
<td>70</td>
<td>70 (0%)</td>
<td>-</td>
<td>70 (0%)</td>
</tr>
</tbody>
</table>

Source: HDR 2017l, 2017m; ITD 2017, 2019

1Data was collected in 2015 or 2016 except for Warm Lake Road data collected in 2017. 2019 data from the ITD was available for SH 55, Warm Lake Road, Johnson Creek Road, Stibnite Road, and Burnt Log Road. AADT is calculated by Total Recorded Count/Number of Days Recorded. All figures have been rounded up to whole numbers.

2The approximate minimum percentage of SGP-related heavy vehicles occurring on the roads.

Public Access

A new road would be constructed under the Johnson Creek Route Alternative over the backfilled Yellow Pine pit connecting Stibnite Road to Thunder Mountain Road. A total of approximately 2.2 additional miles of new road would remain post closure and would be accessible for public use through the Operations Area Boundary and would require revision to the existing FRTA easement with Valley County. Impacts to public access during closure and reclamation would be localized, long-term, and negligible.

Safety and Emergency Access

The Johnson Creek Route Alternative would have greater safety and emergency impacts than Burntlog Route due to additional safety considerations required to use the Johnson Creek Route exclusively, which is in steeper terrain than the Burntlog Route and subject to avalanches and landslides (DAC 2021). Additionally, access through the Operations Area Boundary under the Johnson Creek Route Alternative would be through a single point of ingress and egress and would require safety considerations for mine deliveries and public access. Also, the steep climb to provide access around the Yellow Pine pit would require a wider road with more switchbacks to accommodate the heavy trucks transporting mine supplies and may increase hazardous driving conditions for crew rotation, emergency responses, and wildfire evacuation.

Under the Johnson Creek Route Alternative, improvements to the Johnson Creek Route would include road widening and straightening, as well as drainage and bridge improvements to the Johnson Creek Road.
portion of the Johnson Creek Route. The Stibnite Road portion of the Johnson Creek Route would be improved by straightening curves, retaining walls, and installing culverts. The Johnson Creek Route would require 183 acres of cut and fill in addition to the existing roadways to address traffic safety, geotechnical hazards, landslides, and avalanche zones and may result in periods of road closure, while the Burntlog Route would require 246 acres of cut and fill primarily along a new route. While more acreage would be required for the Burntlog Route in comparison with the Johnson Creek Route, the activity along the Johnson Creek Route would be in proximity to Johnson Creek and the East Fork SFSR, whereas the Burntlog Route location avoids these surface flows. In addition to cut and fill in proximity to these surface flows, any traffic-related spills along the Johnson Creek Route would also occur closer to the streams compared to the Burntlog Route.

The public access route through the Operations Area Boundary would separate public traffic from mine traffic on the road through the Operations Area Boundary thereby reducing potential safety issues. Safety and emergency access impacts from the SGP would be localized, long-term, and minor to major.

4.16.3 Mitigation Measures
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Access and Transportation.

4.16.4 Irreversible and Irretrievable Commitments of Public Resources
4.16.4.1 No Action Alternative
Under the No Action Alternative, there would be no irreversible and irretrievable commitment of public resources as it relates to access and transportation.

4.16.4.2 Action Alternatives
The SGP would alter the roadway system, transportation and public access within the analysis area under both the 2021 MMP and the Johnson Creek Route Alternative. This would constitute an irretrievable commitment of the public resource as the baseline transportation and public access conditions would be restored when the SGP reclamation is completed.

Consumption of renewable and non-renewable resources would be required for infrastructure development, including metals, aggregate, cement, wood, fuel and other materials, which would be an irreversible commitment of these resources. Funds and labor would be irretrievably committed for project permitting and development.

4.16.5 Short-term Uses versus Long-term Productivity
4.16.5.1 No Action Alternative
Under the No Action Alternative, the public access roads developed for the action alternatives would not create any short-term uses that would affect long-term access and transportation productivity.
4.16.5.2 Action Alternatives

Development of the Action Alternatives would result in short-term SGP transportation uses of the road system within the analysis area that would compete with the baseline traffic and public access conditions. Public access would be expanded from baseline conditions temporarily to additional roads and trails including Burntlog Route, the OHV Connector Trail, Johnson Creek Road temporary OSV route, and the Cabin Creek OSV route; however, the Warm Lake to Landmark groomed OSV route and Johnson Creek Road groomed portion from Landmark to Wapiti Meadows Ranch would be closed for the duration of the 2021 MMP and Johnson Creek Route Alternative. During operations under the 2021 MMP, a public access road would be located through the SGP to connect Stibnite Road to Thunder Mountain Road. When the mine operations are closed and the SGP is reclaimed, the long-term productivity of the baseline local transportation and public access conditions would be restored. Under the Johnson Creek Route Alternative, the new and upgraded portions of Burnt Log Road/Burntlog Route would not be constructed.

4.17 Heritage Resources

4.17.1 Impact Definitions, Effects Analysis Indicators. and Methodology

The issues and indicators for potential impacts to historic properties were developed from general issues identified by public and agency comments during the scoping process, consultation, and through professional research. The indicators are quantitative direct or indirect impacts when the appropriate information is available, or otherwise qualitative. The duration and geographic extent of an impact is the temporal and physical expanse of the impact, respectively. Context refers to the significance of an action within a setting, such as society as a whole (human, national), the affected region (regional), the affected interests, and the locality (local or site-specific). The analysis of effects to historic properties includes the following issues and indicators:

Issue: The SGP would impact historic properties through ground disturbing activities during construction, operation, and closure and reclamation phases.

Indicators:
- Location and acres of ground disturbance.
- Number and location of historic properties, including TCPs and CLs.
- Significance of historic properties that could be displaced, damaged, or destroyed.

Issue: The SGP may impact above-ground historic properties, TCPs, and CLs by introducing visual elements that could diminish solitude experiences that may be associated with TCPs and CLs and the integrity of the resources.

Indicators:
- Locations of tall or massive SGP components in relation to above-ground historic properties, TCPs, and CLs.
- Number and location of above-ground historic properties, TCPs, and CLs that may have altered viewsheds as a result of the SGP activities.
**Issue:** The SGP would create noise and vibration that could impact the soundscape, solitude experiences, and fragile standing or partially standing historic properties, TCPs, and CLs.

**Indicators:**
- Vibration causing activities, including very high noise levels, and the locations of activities.
- Number and location of standing or partly standing historic properties, TCPs, and CLs in relation to noise and vibration causing activities.

**Issue:** The SGP may create increased visibility and recreational use at locations with historic properties through increased public access via new roadways and improvements to existing roads, which could potentially lead to loss or destruction.

**Indicators:**
- Location of public access roads that would be improved, constructed, and remain in use following mine closure and reclamation.
- Number and location of historic properties, including TCPs and CLs, that may be impacted.

Potential impacts to historic properties are assessed using the “criteria of adverse effect” (36 CFR 800.5[a][1]), as defined in the implementing regulations for the NHPA. “An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.” The analysis of effects using these criteria is limited to those resources that are listed in the NRHP or have been determined eligible. Under NHPA, there are four broad categories of effect:

No Effect: A determination of No Effect indicates that there are no historic properties within the APE and that the undertaking has no potential of affecting historic properties.

No Historic Properties Affected: A “no historic properties affected” determination indicates that there are historic properties in the APE, but the undertaking would not affect these properties (for example, a historic property is within the visual APE, however, has no view of the proposed undertaking).

No Adverse Effect: A “no adverse effect” determination indicates that there would be an impact on the historic property by the undertaking, but the impact does not meet the criteria of adverse impact in 36 CFR 800.5(a)(1) and would not alter any of the characteristics that make it eligible for listing in the NRHP in a manner that would diminish the integrity of the historic property.

Adverse Effect: An adverse effect indicates that the undertaking would alter, directly or indirectly, any of the characteristics that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property.

Under the NHPA, there is no distinction among levels of effect. If the integrity of historic properties is affected to such a degree to be considered adverse, then efforts to avoid, minimize, or mitigate the effect are undertaken. However, in the NEPA process, impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are often applied when considering the undertaking’s effect to historic properties. The NEPA impacts definitions are provided in Table 4.17-1.
Table 4.17-1  Impact Definitions for Heritage Resources

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>Negligible</td>
<td>No measurable change to the current condition of historic properties would result from Project construction, operation, or reclamation. There would be no effect to the existing NRHP qualities of individual historic properties.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Minor</td>
<td>There would be a small, but measurable change to the current condition of historic properties as a result of Project construction, operation, or reclamation. While a change to a historic property would occur, it would not affect any of the NRHP qualities of individual historic properties, and the eligibility of the property to the NRHP would not be altered.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Moderate</td>
<td>An easily discernable and measurable change to the existing NRHP qualities of historic properties would occur as a result of Project construction, operation, or reclamation. While the existing qualities of an NRHP property may be diminished, it would not be to a degree that the properties’ NRHP eligibility would be altered.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Major</td>
<td>A large, easily measurable change in the current conditions would result in significant impacts to historic properties as a result of Project construction, operation, or reclamation and would substantially alter the NRHP qualities and eligibility status of individual historic properties. This would constitute an adverse effect as defined above.</td>
</tr>
<tr>
<td>Duration</td>
<td>Temporary</td>
<td>Impacts that are anticipated to last no longer than 1 year.</td>
</tr>
<tr>
<td>Duration</td>
<td>Short-Term</td>
<td>Impacts that are anticipated to begin and end within the first 3 years during the construction phase.</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-Term</td>
<td>Impacts are those impacts lasting beyond 3 years to the end of mine operations and through reclamation, approximately 20 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>Impacts are those impacts that would remain after reclamation is completed.</td>
</tr>
<tr>
<td>Context</td>
<td>Localized</td>
<td>Impacts would occur within the Physical and VAV APEs.</td>
</tr>
<tr>
<td>Context</td>
<td>Regional</td>
<td>Impacts would extend beyond the Physical and VAV APEs.</td>
</tr>
</tbody>
</table>

Intensity is the severity or levels of magnitude of an impact.  
Duration is the length of time an effect would occur.  
Context is the effect(s) of an action that must be analyzed within a framework, or within physical or conceptual limits.

The assessments of potential effects to historic properties are presented in the context of Section 106 of the NHPA and focuses on the potential effects of each alternative on historic properties, which for purposes of this assessment includes those listed on or eligible for listing on the NRHP and those that have not yet been evaluated for listing on the NRHP and located within the defined APEs. Resources associated with the Stibnite/Meadow Creek Historic District (10VY262/85-335; NR Inventory #87001186) have been removed from consideration due to the recent determination that the Stibnite Historic District is no longer eligible for listing on the NRHP.

The Nez Perce Tribe, Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes have completed cultural studies, also referred to as ethnographies, that discuss the cultural significance of the project’s location; travel routes, fishing, gathering, hunting, and other practices; identification of potential TCPs, CLs, resource gathering areas, and sacred sites or places among other areas of concern. The cultural studies also address tribal perspectives toward the impacts of mining activities on heritage resources and other tribal resource interests (Battaglia 2018; Lahren 2020; Walker 2019). Specific descriptive qualitative data and quantitative spatial data for these resources are not currently publicly disclosed and are confidential.
The Forest Service consultation with Native American tribal partners is ongoing to learn more about these locations, and the potential effects activities associated with the SGP may have on potential historic properties that may be TCPs, CLs, travel routes, resource gathering, hunting, and fishing areas, and sacred sites/ places.

4.17.2 Direct and Indirect Effects

Effects to historic properties within the Physical APE and VAV APE could take place during all phases of the SGP including construction, operations, exploration, and reclamation. Effects to historic properties during the reclamation phase would likely be avoided because impacts associated with historic properties in the reclaimed areas have already taken place or measures would be in place to avoid impacts to these known historic property locations. The continuation of authorized exploration and CERCLA activities, however, would also not constitute adverse effects to historic properties.

Three categories of heritage resources (NRHP-listed, NRHP-eligible, and NRHP-unevaluated) are considered historic properties for purposes of the assessment of potential effects including physical impact or destruction; or potential visual, vibration, or auditory effects resulting from the construction and operation of the SGP. A GIS-based analysis was utilized to identify those resources that could be reasonably affected; heritage resources that have been determined ineligible for listing on the NRHP were not considered in this analysis.

4.17.2.1 No Action Alternative

Under the No Action Alternative, mining and associated activities at the SGP would not occur. Existing roads would be maintained, but improvements and new road construction would not take place. Noise, vibration, and visual intrusions would not increase in the analysis area from current conditions. Ongoing activities associated with the CERCLA work per the current ASAOC would continue over the next few years would not affect any historic properties.

However, other actions would continue, such as existing and approved exploration activities and reclamation obligations under the Golden Meadows Exploration Project Plan of Operations and EA (Forest Service 2015c). These approved activities include the use of the existing road network, construction of several temporary roads (less than 0.5 mile total) to access drill sites, drill pad construction, and drilling on both NFS and private lands at and near the SGP. The continuation of existing and approved exploration activities at the SGP would result in the continued use of the existing administrative offices, the housing or man camp area, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip (located primarily on patented land).

Traditional cultural uses of the analysis area would continue, including for tribal fishing, hunting, gathering, and spiritual practices. Access to public land in the area would continue as governed by law, regulation, policy, and existing and future landownership constraints.

Under the No Action Alternative, the existing historic properties located in the analysis area would remain in their current states and would be expected to experience natural deterioration over time unless stabilization, rehabilitation, restoration, or preservation measures were applied. Under the No Action
Alternative, there would be no SGP-related permanent ground disturbance or visual, noise, and vibration impacts.

4.17.2.2 2021 MMP

Historic properties could be affected during the construction, operations, exploration, and reclamation phases of the 2021 MMP and the potential for associated activities to effect historic properties is assessed in the following sections. Four major component groups have been identified including the SGP mine site, access routes (including OSV routes), utilities (including the transmission line, VHF repeater sites, and telecommunications site), and off-site facilities.

Mine Site

Physical effects to historic properties within the SGP area would largely be caused by ground disturbance resulting not only from construction and operations, but also related to the increased numbers of people in the SGP area creating the potential for accidental or intentional harm to historic properties by the general public. Auditory and vibratory effects to historic properties could be expected during both the construction and operations phase resulting from increased truck traffic, drilling, and blasting. Visual effects to historic properties may also be anticipated due to the introduction of new infrastructure, lighting, and the alteration of the landscape resulting from the mining activities.

Restricted access to the mine site area during construction, operations, and closure and reclamation would affect tribal access to important sites and resources, some that could be identified as TCPs and CLs. In locations where a sense of solitude, including the soundscapes and viewsheds, is important to the cultural significance, interruptions from noise, vibrations, and alterations in the landscape, could adversely affect a significant aspect of religious and sacred sites or places. Although impacts from construction noise would be temporary and intermittent, these intrusions may potentially disrupt Native American religious and cultural practices. Traditional cultural uses of the area, including tribal fishing, hunting, gathering, and spiritual practices would also be potentially affected by the construction, operation, and reclamation phases of the SGP.

A review of historic properties within the SGP mine area resulted in the identification of one historic property that has been previously recorded within the Operations Area Boundary. Additional heritage resources are present, primarily associated with the Stibnite Historic Mining District which has recently been determined to no longer be eligible for listing on the NRHP due to a loss of integrity (ISHPO 2021). These resources have been determined not individually eligible for listing on the NRHP and would not require further consideration. One site (10VY1488, the Stibnite Lithics site) could be adversely affected by the mine construction and operations. However, if the site could be avoided through siting redesign measures, the effect to the site would not be adverse. Construction and operation of the SGP; however, would have the potential to adversely affect historic properties including TCPs or CLs if avoidance or minimization of potential effects could not be achieved.

Access Routes

The potential effects to historic properties resulting from the access routes associated with the mine must be assessed in two phases: construction and operations; and also, from the perspective of the activities associated with each route and each phase. During construction of the Burntlog Route and mine related
features, the primary access for mine-related traffic would be along Johnson Creek and Stibnite roads. Neither of these roads would require improvements outside of the existing road prisms. Therefore, the potential for physical impacts to historic properties would be minimal. Should historic properties be identified within proximity to or within the existing road prism, care should be taken to avoid impacts to these resources, or provide accommodations for them in the PA. Conversely, the potential for effects related to noise, vibration, or changes in viewshed would exist for historic properties within close proximity to the road corridors. Increased traffic would lead to increases in noise and vibration. Visual effects would not likely be considered adverse as there would be no substantial improvements made to these existing road corridors.

In the context of the Burntlog Route and its construction and use, potential effects to historic properties resulting from the road realignments, new road construction, borrow pits, and staging areas would be anticipated. Physical effects to historic properties resulting in significant damage or destruction could take place and the potential for noise, vibration, and visual effects would also be present both during construction of and use of this route. Additionally, the Burntlog Route would connect to a portion of the historic Old Thunder Mountain Road (FR 440). Included in this route is the road connector to the Meadow Creek Lookout where VHF repeater site installation would occur which would have the potential to affect historic properties.

The proposed groomed OSV route on the west side of Johnson Creek Road between Warm Lake Road and Cabin Creek Road would require tree removal, which could potentially adversely affect culturally modified trees that may be present. This type of heritage resource is known to exist in other areas adjacent to Johnson Creek Road. Mitigation measures for effects to these resources would be stipulated in the PA.

Upgrades to roads could lead to an increase in public usage, and this could increase access to and vulnerability of heritage resources within the analysis area. These activities plus construction noise also could potentially impact TCPs or CLs not yet identified along the access road alignments.

Restricted or altered access to the mine site area during construction and operations closures would affect tribal access to important sites, some that could be identified as TCPs and CLs. The Stibnite and Thunder Mountain roads through the Operations Area Boundary would be closed during the mine operations, potentially restricting access to important tribal resources and sites, although another public access route would be provided. In locations where a sense of solitude including the soundscapes and viewscreens is important to the cultural significance, interruptions from noise, vibrations, and alterations in the landscape, could adversely affect a significant aspect of religious and sacred sites. Although impacts from construction noise would be temporary and intermittent, these intrusions may potentially disrupt Native American religious and cultural practices. Traditional cultural uses of the area, including tribal fishing, hunting, gathering, and spiritual practices would also be potentially affected by the construction, operation, and reclamation phases of the SGP.

During the reclamation period, access roads would again be altered as the mine operations were closed down. During the reclamation period, a new public access road would be constructed over the backfilled Yellow Pine pit, once again connecting Stibnite Road to Thunder Mountain Road through the Operations Area Boundary. The construction of and use of this road would not likely constitute an adverse effect to historic properties. The road would utilize reclaimed mine land. While increased traffic through the
Operations Area Boundary would occur as a result of the road construction, the impacts would be minimal. Along the Burntlog Route, segments constructed for the SGP would be reclaimed and existing portions of the road would be returned to their pre-mining width.

A total of 43 historic properties as defined for this assessment are located within the APEs for the access routes associated with the SGP, including the Burntlog Route and Johnson Creek Road. None of the identified archaeological sites are within the Physical APE. Additionally, the Burntlog Route does utilize a portion of the NRHP-eligible Thunder Mountain Road. Physical impacts to archaeological sites would not be anticipated, however potential visual, auditory, or vibratory effects associated with the construction and use of the Burntlog Route and associated access roads may occur for historic properties in close proximity to the proposed route.

There would be limited potential for physical effects to historic properties along the Johnson Creek Route during construction since there would be no improvements outside the current road prism. However, consideration for potential auditory and vibratory effects resulting from road use during construction are possible. A review of the location of the historic properties, indicates that most are over 700 feet from the limits of the current road prism for the Johnson Creek Route during construction and the Burntlog Route during construction, operations, and closure/reclamation, and would not likely be adversely affected. However, it should be noted that access road construction and use could adversely affect potential TCPs or CLs within the analysis area.

Utilities

Potential effects to historic properties associated with the utility infrastructure would include potential physical effects resulting from ground disturbing activities associated with the replacement of existing transmission line structures with new ones, clearing and installation of new transmission structures on the new alignment, and ground disturbance associated with construction or upgrade of substations and the preparation of the VHF repeater and communication tower sites.

Two historic properties, including Site 10VY1488 (Stibnite Lithics Site) and the Meadow Creek Lookout Site (10VY365) may be physically or visually impacted by components associated with communications and the transmission line. The Stibnite Lithic Site (10VY1488) would potentially be physically and visually impacted; however, physical adverse effects to the Stibnite Lithic Site could be avoided through design and avoidance measures. Visual impacts may also adversely affect the Stibnite Lithic Site. Communications enhancements in the vicinity of the Meadow Creek Lookout, which is currently the location of an existing telecommunications facility, may adversely affect this resource. Although the resource would not be physically impacted, the addition of communications equipment could create an adverse visual effect. Similarly, a VHF repeater site is planned in proximity to the Thunderbolt Lookout, which has been recommended as a historic property by the Forest Service and treated as such and could result in an adverse visual effect to this resource. It should also be noted that the addition of the communications facilities could cause ground disturbance that could affect potential TCPs and CLs. Additionally, a change in the visual landscape also has the potential to affect TCPs of CLs as the introduction of new infrastructure may alter the landscape in such a way as to detract from the cultural significance.
Although the existing transmission line, IPCo Line 328, is historic and has been determined as eligible for listing on the NRHP, maintenance or upgrade of such infrastructure is expected. The line is in use, is maintained, and derives its primary significance from its association with mining in Valley County. Maintenance and upgrade activities would be considered acceptable and would not constitute an adverse effect to the transmission line. Consideration for the impacts to the historic significance of the line and the criteria for which it is considered eligible would be addressed in the PA and provisions for mitigation would be documented should an adverse effect be identified.

A total of 89 historic properties, as defined for this assessment, are located within the APEs for the transmission line and its access roads. An additional seven historic properties are located adjacent to or within a portion of the transmission line, paralleling SH 55 in the vicinity of Donnelly and at the northern end of the transmission line corridor. Twelve of the total number of historic properties are located within the transmission line corridor footprint and include primarily archaeological sites, the transmission line itself, a canal, and several historic roads. It is anticipated that none of these resources would be adversely affected by the proposed improvements if the sites are avoided or potential impacts were minimized through protective measures and redesign opportunities. It is assumed that in many cases, resources in the footprint or construction area would be avoided or spanned. The improvements associated with the transmission line upgrades would also not likely constitute an adverse effect to historic properties located within the VAV. Although viewsheds may be altered by the installation of new taller transmission line structures, distance, wooded conditions, and topography would likely minimize any adverse visual effect. However, it should be noted that access road construction and use could adversely affect potential TCPs or CLs within the APE.

**Off-Site Facilities**

The potential effects to historic properties resulting from the off-site facilities would include physical effects as well as potential visual, auditory, and vibratory effects. Vibratory effects would likely be temporary and identified during the construction phase as would noise. Visual effects, however, should be considered due to the introduction of new facilities on the landscape which could alter the significant characteristics of historic properties including potential TCPs and CLs.

A survey conducted for the SGLF which is proposed to be sited off SH 55 determined that there would be no effect to historic properties if constructed in its current location. There are no above-ground historic properties located within the VAV in proximity to the SGLF. However, the potential effects to potential TCPs and CLs should be evaluated if such historic properties are identified through future consultations with tribal partners.

The second off-site facility, the Burntlog Route Maintenance Facility is located along the Burntlog Route north and east of its intersection with Warm Lake Road. There are no historic properties identified within the physical or VAV APEs for the Burntlog Route Maintenance Facility. However, it should be noted that potential adverse physical and visual effects to currently unidentified historic properties could occur including potential TCPs and CLs. The potential effects to historic properties in these locations, however, would be anticipated to be minimal.
Summary

In summary, under the 2021 MMP, 46 historic properties would be within the physical and VAV APEs and an additional 97 historic properties within the VAV APE. Of those there is potential for 19 to have physical impacts, 68 could experience visual effects, 15 may be susceptible to vibratory effects, and 16 whose integrity could be affected by noise. Additional details on each site and the potential impacts are provided in the Heritage Resources Specialist Report (Forest Service 2022). Impacts to heritage resources would be short term to permanent, localized, and minor to moderate depending on avoidance and mitigation. In addition, potential adverse physical and visual effects to currently unidentified historic properties could occur including potential TCPs and CLs.

4.17.2.3 Johnson Creek Route Alternative

The mining portion of the Johnson Creek Route Alternative would be the same as under the 2021 MMP. The primary focus of the Johnson Creek Route Alternative would be alterations in the mine access plans during operations and reclamation. The Johnson Creek Route Alternative eliminates the construction of the Burntlog Route as presented under the 2021 MMP but would require extensive upgrades to both Johnson Creek Road and Stibnite Road during the construction phase. This alternative would utilize the same off-site facilities as the 2021 MMP except the Landmark Maintenance Facility which would be located on the southwest side of the junction of Warm Lake Road at Johnson Creek Road and the two VHF repeater sites would be located along Johnson Creek Road. The following assessment of potential effects to historic properties resulting from the Johnson Creek Route Alternative utilizes the same major component groups – SGP, Access Routes, Utilities, and Off-Site Facilities – as those identified from the 2021 MMP. In total, under the Johnson Creek Route Alternative, 44 NRHP-eligible or unevaluated heritage resources would be within the physical APE and an additional 86 within the VAV APE. However, it should be noted that potential adverse physical and visual effects to currently unidentified historic properties could occur including potential TCPs and CLs. Additional details on each site and the potential impacts are provided in the Heritage Resources Specialist Report (Forest Service 2022).

Mine Site

Impacts associated within the Operations Area Boundary would be the same as those described under the 2021 MMP.

Access Routes

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed; there would not be any upgraded or newly constructed roads along that route and access to the mine would solely utilize the Johnson Creek Route. The Johnson Creek Route would utilize Johnson Creek Road to Yellow Pine, and then Stibnite Road (FR 50142) from Yellow Pine to the mine. This route would be utilized for the entire life of the SGP and would require major upgrades along both Johnson Creek Road and Stibnite Road. Similar to the 2021 MMP, seven borrow areas would be created and utilized along the route.

The potential for impacts to historic properties associated with the Johnson Creek Route Alternative includes physical impacts to those historic properties that would be impacted by ground disturbance associated with the necessary cut and fill episodes for road upgrades and the excavation and use of the borrow pit areas. Major improvements would be required for both Johnson Creek Road and Stibnite Road.
that could physically affect historic properties. Other impacts could include visual intrusions, particularly during the construction phase and road upgrades, but these would be considered short term. Once the road improvements are completed, the visual change on the landscape would be minimal. Vibratory and auditory effects could also be anticipated during construction and operation due primarily to increased traffic along the route which would include large trucks, mine traffic, and increase public access.

A total of 16 historic properties as defined for this assessment are located within the APEs for the Johnson Creek Route. Construction and operation activities would have the potential to adversely affect these resources if avoidance or minimization of potential effects could not be achieved. A review of the historic properties within the physical APE along the Johnson Creek Route identified four historic properties which may fall within the construction footprint and could be adversely affected by ground disturbing activities and/or destruction. Additional historic properties are within the VAV APE for the Johnson Creek route including the Landmark Ranger Station. Temporary adverse effects to the Landmark Ranger Station may occur during road construction, however once the construction is complete, it is not anticipated that long term visual, auditory, or vibratory adverse effects from the Johnson Creek Route upgrade would occur. However, it should be noted that potential adverse physical and visual effects to currently unidentified historic properties could occur including potential TCPs and CLs, if present.

**Utilities**

Impacts would be the same as those described under the 2021 MMP with the exception of the VHF repeater sites which would be located along Johnson Creek Road. The Johnson Creek Route Alternative would include VHF repeater site construction and maintenance via helicopter to reduce access road needs within IRAs managed for backcountry restoration. Helicopter use could increase noise levels in the vicinity of some historic properties intermittently and short-term during construction and then maintenance.

**Off-Site Facilities**

Impacts related to the SGLF would be the same as those described under the 2021 MMP. The construction of the Landmark Maintenance Facility could pose potential physical and visual effects to historic properties. The location is adjacent to the historic Landmark Ranger Station and the introduction of a modern facility would likely alter the viewshed for the Landmark Ranger Station. It is anticipated the Landmark Maintenance Facility would adversely visually affect the Landmark Ranger Station. Consideration for the potential adverse impacts to previously unidentified historic properties, including TCPs and CLs would take place as consultation continues and under the stipulations of the PA.

**Summary**

A total of 44 historic properties are located within the physical and VAV APE and an additional 86 historic properties are located only within the VAV APE. Of those there is potential for 18 to have physical impacts, 66 could experience visual effects, 14 may be susceptible to vibratory effects, and 15 whose integrity could be affected by noise. Impacts to historic properties would be short term to permanent, localized, and minor to moderate depending on avoidance and mitigation. In addition, potential adverse physical and visual effects to currently unidentified historic properties could occur including potential TCPs and CLs.
4.17.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. The mitigation measures described below are in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis.

For this Project, the Forest Service determined that a PA would be required to ensure compliance with the NHPA and 36 CFR 800. The PA is being drafted to include provisions for identification of historic properties, mitigation for adverse effects to historic properties, the preparation of a Historic Properties Management Plan (HPMP), and subsequent Historic Properties Treatment Plans (HPTPs) to address effects to historic properties over the life of the SGP.

The HPMP applies to both public and private lands within the SGP’s APEs and is designed to address the process by which previously unknown historic resources would be identified, evaluated, and assessed for potential effects pursuant to the requirements of Section 106 of the NHPA. The HPMP would also address the process by which previously identified sites in uninventoried areas within the physical APE would be re-identified, evaluated, and assessed for potential effects. The goal of the HPMP is to incorporate the management of historic properties with the management and operation of the SGP, without unnecessary delays and in a manner that addresses the historic properties within the APE in accordance with applicable legal requirements. Management options are designed to ensure that effects on historic properties are avoided and include preservation in place, ongoing use, monitoring, public and company education, closure or isolation of specific properties, and stabilization. This HPMP attempts to protect resources, provide positive benefits for the preservation of cultural values, and recognize consideration of the effects on historic properties. The HPMP is intended to:

- Comply with stipulations developed jointly by the Signatory, Invited Signatory, and Concurring Parties as outlined in the PA;
- Summarize the results of previously conducted cultural resources surveys and the identification of historic properties, including any TCP in the APE;
- Develop a process for phased identification efforts for previously uninventoried portions of the SGP APEs and incorporating design changes to the SGP to avoid or minimize adverse effects on historic properties;
- Describe a process for evaluation of heritage resources for eligibility for inclusion on the NRHP;
- Address the assessment of effects and how adverse effects to historic properties would be resolved in consultation with Perpetua and other consulting parties;
- Develop ways to avoid, minimize, or mitigate adverse effects on historic properties;
- Define impact/adverse effect avoidance measures for performing operations and maintenance activities;
- Determine the curation process for all recovered heritage resource materials as a result of the SGP;
- Establish the process for managing unanticipated discoveries; and
- Confirm the process for managing discovery of human remains taking into account applicable state laws, local laws, and the NAGPRA (U.S.C. § 3001) on federal lands.
In tandem with the HPMP, a HPTP would be prepared to address mitigation of adverse effects to known historic properties at the time the PA is executed. Subsequent HPTPs would also be prepared to address mitigation for adverse effects to currently unidentified historic properties as determined necessary by the Forest Service over the life of the SGP. The purpose of the HPTP would be to streamline the resolution of adverse effects to historic properties located within the SGP and would be prepared in accordance with the stipulations set forth in the PA.

4.17.4 Irreversible and Irretrievable Commitments of Public Resources

Historic properties are considered a public resource, and their destruction (partial or complete) is a permanent and irreversible effect. They are non-renewable resources. Uses of historic properties include recreational destinations, public displays, research by universities and cultural resource professionals, and tribal use of TCPs or CLs. If historic properties are disturbed, damaged, or destroyed by ground disturbance or restricted access due to implementation of the SGP, these uses becomes permanently unavailable. If traditional use areas become unavailable for use for the foreseeable future by tribes in the SGP area, this would constitute an irretrievable commitment of resources (Forest Service 2022q).

The consequences associated with irreversible and irretrievable commitments may include significant loss of tribally significant resources and the inability of tribal members to utilize traditionally important resources or access traditionally important places.

4.17.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. Consequently, there would be no irreversible and irretrievable commitment of historic properties beyond that currently occurring.

4.17.4.2 Action Alternatives

Historic properties that could be impacted by the SGP constitute an irreversible commitment, regardless of mitigation. Once gone, only the data collected remains; the resources cannot be used for any additional purposes.

The restriction of public access in the Operations Area Boundary would remove the land from other uses while the SGP is in operation, but the use would eventually be reversed through removal of the exclusion area and reclamation. Lack of access to TCPs and CLs by tribes would be an irretrievable commitment of resources because a generation of tribal members is likely to lose traditional knowledge of these places; this is an impact to tribal rights and interests (Forest Service 2022q).

Implementation of any action alternatives could result in an irretrievable commitment of historic properties if avoidance and mitigation measures of the SGP are not implemented.

4.17.5 Short-term Uses versus Long-term Productivity

The resilience of historic properties is very low in comparison to other social or biological resources because actions associated with the SGP that may affect historic properties would be permanent. Once a historic property is disturbed or possibly damaged or destroyed through ground disturbance or through increased public use of the area, which can lead to ground disturbance, it cannot be replaced. The duration of the use is not important, because the damage to a historic property, such as a precontact archaeological
site, can occur immediately. Additionally, restricted access in the Operations Area Boundary for the duration of the SGP would adversely affect long-term productivity, because, over the life of the mine, a generation of tribal members would experience loss of traditional knowledge and use of culturally significant resources and places. Short-term uses and uses such as temporary staging areas for reclamation material or access roads that would later be returned to their pre-construction state have the potential to permanently impact historic properties. There is the potential for the loss of long-term productivity to any historic properties subjected to short-term use.

4.17.5.1 No Action Alternative

Under the No Action Alternative, the SGP would not be undertaken. Consequently, there would be no short-term use that would affect historic properties and no effect on long-term productivity.

4.17.5.2 Action Alternatives

Under either action alternative, all short-term direct impacts to historic properties would lead to a loss of long-term productivity. Some short-term protection measures could lead to long-term productivity (use of a historic property for data, interpretive, or cultural purposes) of resources. If TCPs or CLs are identified, short-term use may be denied while protecting long-term productivity.

4.18 Public Health and Safety

4.18.1 Impacts Definitions and Effects Indicators and Methodology

The analysis of effects to public health and safety from the SGP includes the following issues and indicators:

**Issue:** The SGP may affect public safety on the roads used by mine vehicles during construction, operation, and closure activities.

**Indicators:**

- Number of SGP-related vehicles trips on public roads.

**Issue:** The SGP may affect human health or exposure to hazards (e.g., via ingestion or inhalation of soil, air, fish, and water).

**Indicators:**

- Change in public health statistics.
- Changes in health metrics such as soil, air, and water quality.
- Quantity of hazardous materials transported on access roads.
- Risk of natural hazards (wildfire, avalanche, landslide).

**Issue:** The SGP may affect infrastructure and services as related to emergency services, medical services, utilities, sanitation, and wastewater treatment.
Indicators:
- Capacity of existing infrastructure and services to meet anticipated increased use.

Issue: The SGP may cause public health effects related to changing environmental conditions.

Indicators:
- Changes in soil, air, and water quality.
- Disruption at recreational areas during construction, operation, and closure and reclamation.
- Psychological effects due to noise.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Public health and safety was analyzed using baseline health statistics obtained from federal, state, and local government agencies, scientific literature reviews, and information and analysis documented in reports prepared for the SGP. The evaluation of public health and safety effects relies heavily on the analyses conducted for other resources as they relate to public health impacts.

In assessing the potential for health impacts due to the SGP, the types of health impacts (e.g., chronic disease, injury, well-being, etc.) selected and described in the affected environment discussion in Section 3.18 are evaluated and the magnitude of the health impact is assessed. In assessing the magnitude of the impact (high, medium, low, or none), the following factors are evaluated: the actual consequence (e.g., minor injury/illness or severe injury or death), the duration of the exposure, and the number of people potentially affected. In addition to categorizing the magnitude of the impacts, effects are categorized as positive or negative, with information on potential mitigation provided (Table 4.18-1).

Table 4.18-1 Definitions of Magnitudes Measure of Health Impacts

<table>
<thead>
<tr>
<th>Magnitude of Health Impact</th>
<th>Positive Effect</th>
<th>Negative Effect</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No discernible or measurable impacts</td>
<td>No discernible or measurable impacts</td>
<td>None</td>
</tr>
<tr>
<td>Low</td>
<td>Low level quality-of-life impacts, low/short exposures, limited area/people affected</td>
<td>Low level quality of life impacts, low/short exposures, limited area/people affected</td>
<td>Mitigation measures possible</td>
</tr>
<tr>
<td>Medium</td>
<td>Significant quality-of-life enhancement, or reduced exacerbation of existing illness, or reduced disease incidence; Moderate, intermittent, exposures, relatively localized</td>
<td>Exacerbations of existing illness, reduction in quality of life (e.g., increase in &quot;nuisance&quot; factors such as noise/odors); Moderate, intermittent, exposures, relatively localized</td>
<td>Mitigation measures possible, but minor residual negative effects may remain</td>
</tr>
<tr>
<td>High</td>
<td>Prevent deaths/prolong life</td>
<td>Increase deaths, increase chronic or acute diseases, increase mental illness; High/long duration exposures, over a wide area</td>
<td>Mitigation measures possible, but residual negative effects may remain</td>
</tr>
</tbody>
</table>

Source: International Council on Mining and Metals (ICMM) 2010
As described in the Good Practice Guidance on Health Impact Assessments (ICMM 2010), when analyzing the overall public health impact, the magnitude of the consequence is combined with the possibility that the consequence would occur. There is no universally agreed upon formula for assessing overall public health impact (ICMM 2010). Characterization of public health effects relies on qualitative and quantitative evidence (National Resource Council of the National Academies [NRC] 2011) and the assessments of the magnitude of the impact or possibility of occurrence are often based on a subjective judgement (ICMM 2010) and utilize a matrix approach (Table 4.18-2).

<table>
<thead>
<tr>
<th>Magnitude of Health Impact</th>
<th>Low Possibility of Health Impact Occurrence (unlikely to occur)</th>
<th>Medium Possibility of Health Impact Occurrence (likely to occur sometimes)</th>
<th>High Possibility of Health Impact Occurrence (likely to occur often)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Low</td>
<td>Negligible</td>
<td>Minor</td>
<td>Moderate</td>
</tr>
<tr>
<td>Medium</td>
<td>Minor</td>
<td>Moderate</td>
<td>Major</td>
</tr>
<tr>
<td>High</td>
<td>Moderate</td>
<td>Major</td>
<td>Major</td>
</tr>
</tbody>
</table>

Source: ICMM 2010; NRC 2011

### 4.18.2 Direct and Indirect Effects

This analysis evaluates the magnitude of the potential health issues (both positive and negative) on the potentially affected local population of Valley County, as well as recreational visitors to the area. The scope of this analysis is limited to affected communities outside of the SGP and associated facilities and does not include a direct evaluation of the anticipated workforce safety and health issues that could occur at the mine site, because the action alternatives would be governed by OSHA and MSHA.

#### 4.18.2.1 No Action Alternative

No impacts are anticipated to Public Health and Safety from the No Action Alternative as related to air quality, ground water, terrain, economy, public services and infrastructure, and demographics.

Soil Quality - Legacy soil impacts from historical mining would continue to exist under the No Action Alternative (Soils Specialist Report, Forest Service 2022c). Public health impacts under the No Action Alternative related to soil quality would be localized, long term, and negligible.

Surface Water Quality - The inventoried waterbodies at the Operations Area Boundary would continue to be listed as impaired (except for West End Creek) for specific uses in accordance with CWA Section 303(d) due to arsenic (plus antimony and mercury at some locations) for exceedances of Idaho’s human health criterion for consumption of water and organisms (Water Quality Specialist Report, Forest Service 2022f). The existing conditions of these waterbodies is expected to be maintained under the No Action Alternative until the CERCLA actions under ASAOC take place at which time the conditions of the surface water are expected to improve. The IDEQ may also identify goals towards developing a water quality improvement plan/total maximum daily loads for the East Fork SFSR. Public health impacts under the No Action Alternative related to surface water would be localized, long term, and negligible.
4.18.2.2  2021 MMP

The 2021 MMP has the potential to result in direct and indirect effects to public health and safety through alterations in environmental conditions; economic conditions; local public services and infrastructure; and land use and demographics. Table 4.18-3 summarizes the assessed impacts described in the following sections and presents the overall public health impact rating of each impact.

Air Quality

Health impacts associated with air emissions can result from inhalation of criteria air pollutants, such as PM$_{2.5}$ and nitrogen oxides (NO$_x$), as well as inhalation of hazardous air pollutants (e.g., metals, polycyclic aromatic hydrocarbons). Potential impacts to air quality associated with the 2021 MMP assume that the SGP would be designed, constructed, and operated in compliance with appropriate air pollution controls to comply with applicable regulations and any air quality permits issued by the IDEQ with dust control, dust suppression, and/or dust abatement measures implemented. Air emissions were estimated for each activity and process source included in the 2021 MMP for all phases of the SGP. The highest combined pollutant annual emissions (including fugitive dust) were predicted to occur in Mine Year 7 (after up to 3 years of construction and pre-production activities and during the 4th year of mining). The predicted emissions of PM$_{10}$ and PM$_{2.5}$, along the Operations Area Boundary or within one mile of the boundary, were also largest in Mine Year 7 (Air Quality Specialist Report, Forest Service 2022a).

Predicted ambient air concentrations for critical air pollutants (carbon monoxide, NO$_x$, PM$_{2.5}$, PM$_{10}$, sulfur dioxide, and ozone) at the Operations Area Boundary, where the public is not restricted, were shown to be below the NAAQS. The NAAQS (Section 3.3) are allowable air concentration limits adopted by the State of Idaho into the Rules for the Control of Air Pollution in Idaho and are considered protective of public health. Also, the results of the Class II near field air quality analysis show that predicted ambient concentrations of the criteria pollutants are below the Class II Prevention of Significant Deterioration increments. This comparison was performed to examine air quality conditions in proximity to the FCRNRW and Nez Perce Tribal Land.

The NAAQS are set at a level expected to protect public health with an adequate margin of safety, taking into consideration effects on susceptible populations (EPA 2012). Because individual thresholds vary from person to person due to individual differences in susceptibility and pre-existing disease conditions (e.g., asthma or reactive airway disease), there may be some health effects associated with PM$_{2.5}$ for sensitive susceptible individuals even if ambient PM$_{2.5}$ levels meet the air quality criteria (EPA 2009, 2012). Levy et al. (2002) estimated that a 1 μg/m$^3$ increase in daily PM$_{2.5}$ concentration could result in a 1 percent increase in asthma-related emergency room visits.

Health impacts associated with air quality would be localized, long term, and negligible.
Table 4.18-3  Summary of Public Health Impacts for the 2021 MMP

<table>
<thead>
<tr>
<th>Category Relevant to Public Health</th>
<th>Potentially Affected Resources</th>
<th>SGP Specifics</th>
<th>Impact Relevant to Public Health and Safety</th>
<th>Possible Health Impact</th>
<th>Positive or Negative Health Impact?</th>
<th>Pathway of Health Impact</th>
<th>Magnitude of Impact</th>
<th>Possibility of Impact</th>
<th>Overall Impact on Public Health (Magnitude x Possibility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Air</td>
<td>Localized impacts to air quality from fugitive dust and particulate emissions during mine operations; diesel emissions from vehicle traffic and machinery</td>
<td>Inhalation of pollutant emissions</td>
<td>Chronic Disease - Well-Being / Psychosocial</td>
<td>Negative</td>
<td>Direct – Pollutant Inhalation</td>
<td>Construction and Operations: Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Environment</td>
<td>Soil</td>
<td>Deposition impacts to soil from proposed mine operations</td>
<td>Direct contact with hazardous pollutants</td>
<td>Chronic Disease - Well-Being / Psychosocial</td>
<td>Negative</td>
<td>Direct - Contact</td>
<td>Construction and Operations: Medium</td>
<td>Low Closure and Reclamation: Low</td>
<td>Low</td>
</tr>
<tr>
<td>Environment</td>
<td>Groundwater</td>
<td>Leaching of contaminants to groundwater from proposed mine operations</td>
<td>Degraded environmental quality</td>
<td>Well-Being / Psychosocial</td>
<td>Negative</td>
<td>Indirect</td>
<td>Construction and Operations: Low</td>
<td>Low Closure and Reclamation: Low</td>
<td>Low</td>
</tr>
<tr>
<td>Category Relevant to Public Health</td>
<td>Potentially Affected Resources</td>
<td>SGP Specifics</td>
<td>Impact Relevant to Public Health and Safety</td>
<td>Possible Health Impact</td>
<td>Positive or Negative Health Impact?</td>
<td>Pathway of Health Impact</td>
<td>Magnitude of Impact</td>
<td>Possibility of Impact</td>
<td>Overall Impact on Public Health (Magnitude x Possibility)</td>
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</tr>
<tr>
<td>Environment</td>
<td>Soil</td>
<td>Reclamation of legacy mining materials</td>
<td>Minimizes direct contact with hazardous pollutants Improved environmental quality</td>
<td>Chronic Disease Well-Being/ Psychosocial</td>
<td>Positive</td>
<td>Direct - Contact</td>
<td>Closure and Reclamation: Medium</td>
<td>Closure and Reclamation: High</td>
<td>Closure and Reclamation: Moderate</td>
</tr>
<tr>
<td>Environment</td>
<td>Soil</td>
<td>Uptake of contaminants from soil into subsistence foods (berries and plants)</td>
<td>Ingestion of contaminants from edible plants and berries</td>
<td>Chronic Disease Nutrition Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Indirect - Bioaccumulation</td>
<td>Construction and Operations: Low</td>
<td>Closure and Reclamation: Low</td>
<td>Construction and Operations: Negligible</td>
</tr>
<tr>
<td>Environment</td>
<td>Surface Water</td>
<td>Direct contact with hazardous pollutants released to surface water</td>
<td>Direct contact with hazardous pollutants Ingestion of hazardous pollutants in fish harvested from local waterbodies</td>
<td>Chronic Disease Nutrition Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Direct</td>
<td>Construction and Operations: Low</td>
<td>Closure and Reclamation: Low</td>
<td>Construction and Operations: Negligible</td>
</tr>
<tr>
<td>Category Relevant to Public Health</td>
<td>Potentially Affected Resources</td>
<td>SGP Specifics</td>
<td>Impact Relevant to Public Health and Safety</td>
<td>Possible Health Impact</td>
<td>Positive or Negative Health Impact?</td>
<td>Pathway of Health Impact</td>
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<td>Overall Impact on Public Health (Magnitude x Possibility)</td>
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</tr>
<tr>
<td>Environment</td>
<td>Surface Water</td>
<td>Reclamation of surface conditions, re-vegetation to reduce run-off of hazardous pollutants to streams and rivers</td>
<td>Minimization of direct contact with hazardous pollutants Reduction of hazardous pollutants in fish harvested from local waterbodies Improved environmental quality</td>
<td>Chronic Disease Nutrition Well-Being/ Psychosocial</td>
<td>Positive</td>
<td>Direct and Indirect</td>
<td>Low</td>
<td>Low</td>
<td>Construction and Operations: Negligible Closure and Reclamation: Negligible</td>
</tr>
<tr>
<td>Environment</td>
<td>Terrain</td>
<td>Disturbance of existing terrain and features</td>
<td>Injury due to natural hazards: avalanche, land slide, flash flooding and water hazards, wildfires</td>
<td>Injury Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Direct - Injury</td>
<td>High</td>
<td>High</td>
<td>Construction and Operations: Moderate Closure and Reclamation: Moderate</td>
</tr>
<tr>
<td>Economy</td>
<td>Personal (income, employment)</td>
<td>Increase in local employment</td>
<td>Increased income Increased food security/ improved nutrition Increased access to health care through employee benefits, including insurance</td>
<td>Chronic Disease Nutrition Well-Being/ Psychosocial</td>
<td>Positive</td>
<td>Indirect</td>
<td>Construction and Operations: Medium</td>
<td>High</td>
<td>Construction and Operations: Major</td>
</tr>
<tr>
<td>Category Relevant to Public Health</td>
<td>Potentially Affected Resources</td>
<td>SGP Specifics</td>
<td>Impact Relevant to Public Health and Safety</td>
<td>Possible Health Impact</td>
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</tr>
<tr>
<td>Economy</td>
<td>Personal (income, employment)</td>
<td>Decrease in local employment</td>
<td>“boom and bust” impact reduced demand for private and public goods and services reduction in demand for labor</td>
<td>Chronic Disease</td>
<td>Negative</td>
<td>Indirect</td>
<td>Closure and Reclamation: Medium</td>
<td>Closure and Reclamation: Medium</td>
<td>Closure and Reclamation: Moderate</td>
</tr>
<tr>
<td>Public Services and Infrastructure</td>
<td>Need for new infrastructure</td>
<td>Worker Housing Facility</td>
<td>Increased access to health care and emergency service support Increased emergency services in remote area</td>
<td>Chronic Disease Infectious Disease Injury Well-Being/ Psychosocial</td>
<td>Positive</td>
<td>Indirect</td>
<td>Construction and Operations: Medium</td>
<td>Construction and Operations: Medium</td>
<td>Construction and Operations: Moderate</td>
</tr>
<tr>
<td>Public Services and Infrastructure</td>
<td>Need for new infrastructure</td>
<td>Worker Housing Facility</td>
<td>Potential transmission of infectious disease</td>
<td>Infectious Disease</td>
<td>Negative</td>
<td>Indirect</td>
<td>Construction and Operations: Medium</td>
<td>Construction and Operations: Low</td>
<td>Construction and Operations: Minor</td>
</tr>
<tr>
<td>Public Services and Infrastructure</td>
<td>Roads</td>
<td>Construction of improved mine access road</td>
<td>Improved access to remote area for emergency responders</td>
<td>Injury Well-Being/ Psychosocial</td>
<td>Positive</td>
<td>Indirect</td>
<td>Construction and Operations: Medium</td>
<td>Construction and Operations: Medium</td>
<td>Construction and Operations: Moderate</td>
</tr>
<tr>
<td>Category Relevant to Public Health</td>
<td>Potentially Affected Resources</td>
<td>SGP Specifics</td>
<td>Impact Relevant to Public Health and Safety</td>
<td>Positive or Negative Health Impact?</td>
<td>Pathway of Health Impact</td>
<td>Magnitude of Impact</td>
<td>Possibility of Impact</td>
<td>Overall Impact on Public Health (Magnitude x Possibility)</td>
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<tr>
<td>Public Services and Infrastructure</td>
<td>Roads</td>
<td>Construction of improved mine access road, Increased trucking traffic on mine access routes</td>
<td>Increased potential for hazardous waste spill Increased potential for traffic accidents</td>
<td>Injury Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Direct</td>
<td>Construction and Operations: High Closure and Reclamation: High</td>
<td>Construction and Operations: Major Closure and Reclamation: Major</td>
<td></td>
</tr>
<tr>
<td>Public Services and Infrastructure</td>
<td>Transmission Lines</td>
<td>Increased power demand to support mine operations</td>
<td>Increased exposure to electro-magnetic field (EMF) along transmission lines</td>
<td>Chronic Disease Injury Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Direct</td>
<td>Construction and Operations: Low Closure and Reclamation: Low</td>
<td>Construction and Operations: Negligible Closure and Reclamation: Negligible</td>
<td></td>
</tr>
<tr>
<td>Demographics</td>
<td>Land use</td>
<td>Disturbance of current recreational land use</td>
<td>Alteration or elimination of recreational sites</td>
<td>Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Indirect</td>
<td>Construction and Operations: Low Closure and Reclamation: Low</td>
<td>Construction and Operations: Negligible Closure and Reclamation: Negligible</td>
<td></td>
</tr>
<tr>
<td>Demographics</td>
<td>Land use</td>
<td>Noise disturbances during mine blasting and vehicle noise along access routes</td>
<td>Psychological effects due to noise</td>
<td>Well-Being/ Psychosocial</td>
<td>Negative</td>
<td>Indirect</td>
<td>Construction and Operations: Low Closure and Reclamation: Low</td>
<td>Construction and Operations: Negligible Closure and Reclamation: Negligible</td>
<td></td>
</tr>
</tbody>
</table>
Soil Quality

Legacy soil impacts from historical mining plus significant soil disturbance is expected under the 2021 MMP (Soils Specialist Report, Forest Service 2022c). Thus, additional soil contaminants may be exposed during the construction and operation phases of the SGP. However, these soil impacts would be limited to the active mining areas, with restricted public access.

Releases of hazardous materials could range from a minor to large spills within the Operations Area Boundary or the off-site facilities, or along access routes. Depending on the nature of the spill and the effectiveness of spill responses, a release could potentially lead to exposures to contaminants in soil. The direct and indirect effects of a spill may range from negligible to major depending on the spill incident but based on the planned infrastructure specifically designed for the storage and management of hazardous materials, a large release to the environment within the Operations Area Boundary or off-site facilities would not likely occur. In the event a release was to occur, it would likely be relatively small in volume based on estimated container volumes and would be addressed promptly as per the SPCC Plan and Spill Response Plan. The SPCC Plan would address site-specific spill prevention measures, fuel haul guidelines, fuel unloading procedures, inspections, secondary containment of all on-site fuel storage tanks, and staff training. The Solid and Hazardous Materials Handling and Emergency Response Plan would address response and cleanup for any spill of hazardous materials, including concentrate, on all transport routes. The plan would include a sampling plan to assure that all spilled material is cleaned up and would include contingency plans for remediation of potential impacts to soil, wetlands/riparian, and water resources.

In the event that large quantities of hazardous materials are spilled into the environment from a transportation incident, or in the event that a spill is not immediately discovered or addressed, the impact could be more substantial. For these reasons, the magnitude of the health impact related to soil quality is rated as “medium” on Table 4.18-3, because some exposure of legacy contamination and/or a release of hazardous materials (ranging from small to large quantities) is possible. However, the possibility of the impacts on public health is rated as “low,” because the public access is restricted in the active mining area, public access would be limited during response actions along access routes, and the probability of a large spill is low.

During closure and reclamation, RCM would be used as surface material to support vegetation growth and slope stability. The Reclamation and Closure Plan includes appropriate types and concentrations of material that would be protective of human receptors when identifying suitable RCM. The reclamation process is expected to lead to an overall reduction in chemical impacts to surface soil by removing potential sources of metals leaching into the soils, removing sources of erosion and sedimentation, reducing erosion of soils and sedimentation, and reducing downstream sediment transport. Thus, potential negative impacts to soil due to mining disturbance would be largely offset by positive impacts from reclamation of legacy contamination. Therefore, the evaluation of the potential public health and safety impacts associated with exposure to contaminants in soil during the closure and reclamation phase would be negligible (Table 4.18-3).

Idaho Department of Health and Welfare (IDHW) reviewed available information from the proposed Reclamation and Closure Plan for the SGP to consider whether potential health risks from metals in soils
exist for future site users. The IDHW Letter Health Consultation stated that based on information available in the Reclamation and Closure Plan, concentrations of arsenic and antimony in surface soil adjacent to the site may exceed the health-based screening values. The IDHW included recommendations for additional characterization to adequately assess risks to public health and recommended that potential human exposure following closure and reclamation should be considered when identifying RCM to ensure protection of recreational receptors (IDHW 2019).

Soils used for reclamation would be screened based on their concentrations of arsenic, antimony, and mercury to exclude materials with metal concentrations outside the range of natural baseline conditions or with metal leaching potential. While natural baseline metal concentrations at times exceed health-based screening values, the reclaimed site would not pose an increased human health risk compared to the existing site conditions. The exposure risk associated with existing site conditions is not expected to result in any adverse effects (ATSDR 2003). Exposure risk could be further reduced through administrative controls such as exclusion of the public from private land portions of the reclaimed site and enforcement of PNF camping stay limits on public lands.

**Surface Water Quality**

The inventoried waterbodies at the mine site have designated beneficial uses of “cold water communities,” “salmonid spawning,” and “primary contact recreation.” All waterbodies except Sugar Creek have additional designated beneficial uses of “drinking water supply” and presumed beneficial uses of “secondary contact recreation.” Sugar Creek has additional beneficial uses of “agricultural water supply” and “wildlife habitat.” However, under existing conditions, each of these inventoried waterbodies (except for West End Creek) are listed as impaired for specific uses in accordance with CWA Section 303(d). The causes for listing of these waters are associated with arsenic (plus antimony and mercury at some locations) for exceedances of Idaho’s human health criterion for consumption of water and organisms (Water Quality Specialist Report, Forest Service 2022f). Operational and post-closure concentrations of these elements in the East Fork SFSR are predicted to be comparable to or less than the existing conditions. The IDEQ may also identify goals towards developing a water quality improvement plan/total maximum daily loads for the East Fork SFSR.

**Groundwater Quality**

Groundwater analyte concentrations beneath the mine site, particularly in the vicinity of the TSF, TSF Buttress, Hangar Flats pit backfill, and Yellow Pine pit backfill, are expected to increase in response to constituent leaching from development rock. However, existing groundwater in those areas typically does not meet regulatory criteria for use as drinking water due primarily to arsenic and antimony concentrations (Water Quality Specialist Report, Forest Service 2022f).

There are three permitted wells on the mine site which are controlled by Perpetua: the Gestrin Airstrip mining well, the original temporary camp water supply well, and the new camp water supply well. Use of these wells for drinking water supply would require water treatment for arsenic and antimony removal. There are no active domestic groundwater wells used for residential drinking water within 15 miles of the SGP. Yellow Pine’s public water system uses surface water from Boulder Creek, which is located approximately 15 miles downstream of Yellow Pine. Because groundwater is not currently used as a public drinking water source at the SGP and is assumed to be unlikely to be used as a drinking water
source in the future, the ATSDR Public Health Assessment conducted for the existing mine site eliminated the groundwater as drinking water pathway from consideration as a public health concern (ATSDR 2003). The IDEQ would further regulate groundwater quality standards under its IPDES permit.

Public health impacts related to groundwater would be localized, long term, and negligible.

**Terrain**

Potential public health and safety impacts can result from hazards associated with disturbance of existing terrain and features, including flash flood, wildfires, avalanches, and landslides. Steep slopes and uneven terrain also present potential hazards for recreational visitors. The SGP is not expected to exacerbate any of these existing hazards, but could increase the risk of damage, injury, or loss of life from the hazards due to the increased number of people traveling through the area to the SGP.

In particular, existing avalanche hazards on the Stibnite Road portion of the Johnson Creek Route would persist and could impact travel along this route during the construction period. Construction of the SGP would not increase the avalanche hazard but increased construction period road use would increase the risk of damage, injury, or loss of life from existing avalanche hazards temporarily followed by a risk decrease upon transition to use of the Burntlog Route for operational access (Access and Transportation Specialist Report, Forest Service 2022k). Conversely, the risks from existing avalanche hazards along the Burntlog Route would increase due to increased vehicular traffic during mine operations and closure/reclamation activities.

Public safety impacts related to terrain would be localized, long term, and moderate.

**Economy**

Potential positive health impacts associated with the 2021 MMP on local economic conditions are indicated in Table 4.18-3. The 2021 MMP would make a significant contribution to the Valley County economy in terms of direct and indirect employment and wages during the life of the SGP (Social and Economic Conditions Specialist Report, Forest Service 2022o). In addition, the 2021 MMP would generate significant tax revenues for various levels of government. The economic benefits associated with increased employment opportunities and tax revenues could lead to continued or improved access to health services, better nutrition, and better overall well-being for the local community. Also, if the new fulltime positions include health insurance and improved access to health care, this may have a positive effect on chronic and infectious disease and injury categories for both the employees and their families.

Conversely, the “boom and bust” related decrease in mine-closure related local employment and labor income also could have significant adverse effects on the local economy. While there could be some residual economic benefit to the community following closure and reclamation, there also could be an indirect or induced negative impact associated with the reduction in work force resulting from mine closure with reduced economic activity indirectly impacting public health through loss of income and/or services.

Public health impacts related to the economy would be beneficial, regional, long term, and major during construction and operations. During and after reclamation and closure, impacts (i.e., decrease in employment and services) would be negative, regional, and moderate.
Public Services and Infrastructure

The 2021 MMP would add traffic volumes to various roadways in the analysis area during construction, operation, reclamation, and closure. During construction, Warm Lake (CR 10-579), Johnson Creek (CR 10-413), and the Stibnite segment of the McCall-Stibnite (CR 50-412) roads would be affected during the first 3 years of the SGP by construction activities until the Burntlog Route is completed. Once Burntlog Route is completed, the substantial increase in traffic volume would shift to exclusively Warm Lake and Burnt Log (FR 447) roads as they are parts of the Burntlog Route.

Existing traffic volumes on Warm Lake Road are at least 15 times greater than the other access roads. Mine-related traffic on Warm Lake Road would increase by approximately 5 percent during construction and operation activities, and traffic volume on Burntlog Route would more than triple during the operation phase (Access and Transportation Specialist Report, Forest Service 2022k). While increases in traffic volume are expected due to SGP-related activities, overall traffic volume on these access roads would still be low due to the remote location and low-density population in the area. While the potential for accidents could increase due to the increased SGP-related traffic volume, the predicted 5 percent increase in traffic volume due to SGP activities on Warm Lake Road is minimal.

Upon completion of the Burntlog Route, the public could access Thunder Mountain Road (FR 50375) using the Burntlog Route as an alternative to access from Stibnite Road (CR 50-412). This could provide improved access to remote recreational areas and better access for emergency responders, which could result in positive impacts to public health and safety. Thus, the magnitude of impact of the Burntlog Route shown on Table 4.18-3 is “medium” and positive and the possibility is rated as “high,” with an overall public health rating of “moderate” positive. Public health and safety impacts related to improved access would be localized, long term, and moderate.

The 2021 MMP would require upgrades to an existing 69-kV transmission line to 138-kV to support mine operations. Local communities may indirectly benefit from improved utilities, such as upgraded transmission lines, that could indirectly lead to positive public health impacts, which could offset any negative public health concerns related to these upgrades.

The EMF generated by a power line depends on both the current in the line and the distance from it. When the voltage of a line is increased, it requires greater clearance and, thus, must be installed at a greater distance from the ground. When voltage is doubled, as in this case, the current drops by half. When combined with the increased distance, the EMF at ground level is reduced by two-thirds (IPCo 2013). Public health impacts related to EMF would be localized, long term, and negligible.

On-site facilities in the Operations Boundary Area would include a worker housing facility with recreation resources, water storage and distribution facilities, fuel storage and dispensing facilities, communication infrastructure, and sewage disposal facilities (Midas Gold 2016a). In addition, on-site facilities would include a safety department with the primary function of ensuring worker safety and training. Emergency medical technicians and emergency equipment and supplies would be on-site, including an ambulance, first aid, and medical supplies. These facilities would minimize the demand on the local services and provide medical services for workers and site-visitors in an otherwise remote area. There could be an indirect positive benefit for the local communities because employees from the local community could use the SGP services; SGP employees not relying on the existing infrastructure or local...
services could indirectly allow more local access. Public health and safety impacts related to health services would be localized, long term, and moderate.

However, with 500 or more employees living and dining in relatively close quarters, the potential for transmission of infectious diseases exists. Employees from the local community who lodge at the on-site facility could potentially transmit infectious diseases to the local communities upon return from the on-site housing facility. However, worker safety protocols include basic measures for good hygiene and protection of infectious disease transmission; and on-site health care services would provide basic treatments for worker illnesses. In addition, while dining and recreational areas would be common spaces, the personal spaces/sleeping quarters would be designed for individual employees (Midas Gold 2016a). Thus, while the magnitude of possible infectious disease transmission would be “medium,” the possibility of occurrence would be “low” due to worker health and safety protocols, on-site health services, and single-employee personal spaces/sleeping quarters. Public health impacts related to transmission of infectious diseases would be localized, long term, and minor.

**Demographics**

The closest (non-SGP) occupied residence is in Yellow Pine, approximately 14 miles west of the mine site. Most of the SGP area is currently open to the public, as most of the land is public land managed by the Forest Service. Common users of the Operations Area Boundary area include Forest Service employees, Perpetua employees and contractors, residents of Yellow Pine, and recreationists. Participation in recreational activities can result in positive effects on physical and mental health. The 2021 MMP could directly or indirectly impact the access, use, and quality of the recreational sites in the SGP area (Recreation Specialist Report, Forest Service 2022m). While no direct health impacts would be anticipated from impacts to recreation sites, it is possible that there could be emotional stress associated with displacement that could occur for some recreationists, affecting the overall well-being of those individuals. Loss of recreational sites could result in less opportunity for the local community to engage in recreational activities, which could reduce positive health benefits. However, there are other nearby recreational sites that would be unimpacted by the 2021 MMP. In addition, improved road conditions and some of the road re-alignments could result in increased access to additional recreational activities. Thus, the magnitude of impact on recreation as it relates to public health is “low” and the possibility is rated as “low.”

Activities in the Operations Area Boundary area related to nutrition include fishing, hunting, or gathering of berries (or other edible vegetation). Contaminants in surface water could potentially bioaccumulate in the edible tissues of fish in impacted surface water or in wildlife that drink impacted surface water. Likewise, contaminants in soil could potentially bioaccumulate in plants growing in impacted soils. As discussed above, implementation of controls and surface water management during mine operations and the closure and reclamation activities would likely decrease concentrations of contaminants in soil and surface water relative to existing conditions. Public health and safety impacts related to consumption of fish, wildlife, or plants would be localized, long term, and negligible.

Noise at the mine site and access roads would consist of an assortment of sounds at varying frequencies from typical operations, as well as noise associated with road construction and SGP-related traffic (Noise Specialist Report, Forest Service 2022d). Noise levels were predicted for anticipated noise sources during
the construction, operations, and closure and reclamation phases of the SGP at 12 noise receptor locations in the SGP area, as well as at various locations in the FCRNRW Area at a range of distances from the SGP access road (Burntlog Route). Of these noise receptor locations, the Miller Residence and the locations in the FCRNRW Area are the most relevant to the public health evaluation. During the construction phase, the 2021 MMP would have a temporary impact on the noise environment at the Miller Residence, while transmission line work is occurring in the immediate vicinity of the residence. Absent transmission line work, the estimated daytime noise levels at the Miller Residence would be 41 dBA and average day-night noise levels would be 39 dBA during the construction phase, below the outdoor threshold of 55 dBA.

During the construction phase, borrow area activities along the Burntlog Route would result in noise level increases above ambient noise levels within approximately 1,000 feet of a borrow area. Resulting noise levels would be at or above the recommended noise level of 55 dBA for outdoor use areas within 500 feet of a borrow area, but below this level farther way. Resulting noise levels approximately 3,000 feet from the roadway would be below the recommended noise level of 55 dBA for outdoor use areas. Direct effects on recreationists within 1,000 to 2,000 feet of borrow areas could include general annoyance or sleep disturbance at campsites in wilderness areas. Indirect effects could include a reduction in the overall quality of the remote wilderness experience. Overall, the potential noise impact on recreationists from borrow areas would be limited to a discrete area within approximately 1,000 to 2,000 feet of borrow areas located along the Burntlog Route where it closely borders the adjacent wilderness area. Noise from these borrow areas would likely be periodic or intermittent, but ongoing throughout the construction phase. Although there would be small increases of noise during the construction phase, they would be temporary and intermittent. Therefore, the magnitude of impact on public health as it relates to noise is “low,” and the possibility is rated as “low.”

During the operations or closure and reclamation phases, the 2021 MMP would have negligible to no effect on the noise environment at the Miller Residence or the various locations in the FCRNRW Area. For these reasons, the magnitude of impact on public health as it relates to noise is “low” and the possibility is rated as “low.”

Public health and safety impacts related to recreational displacement and noise would be localized, long term, and negligible.

4.18.2.3 Johnson Creek Route Alternative

Health and safety effects of the Johnson Creek Route Alternative would be similar to those for the 2021 MMP with the exception of effects of the Johnson Creek Route use as the primary access throughout the project. Use of Johnson Creek (CR 10-413) and Stibnite (CR 50-412) roads as the primary route to the Operational Area Boundary during construction, operations, and closure and reclamation would result in increased noise, traffic, and safety-related issues from SGP-related traffic along the route. The Johnson Creek Route Alternative would route all mine-related traffic through the Village of Yellow Pine and public traffic and mine traffic would share the same road from Landmark to the SGP. Additionally, the Johnson Creek Route Alternative would result in one point of entry to the SGP, effectively combining public access with SGP traffic for the life of the mine. This limited ingress/egress to the SGP site would impact emergency vehicle access during periods of road blockage.
The Johnson Creek Route Alternative would lead to greater road-related and traffic-related public health and safety impacts compared to the 2021 MMP. The possibility of impacts to public safety due to sole use of the Johnson Creek Route increased from “medium” to “high” and if a wildfire, avalanche, or landslide were to occur, the potential effects due to an injury to an individual could be more severe compared to the 2021 MMP and its two access routes.

4.18.3 Mitigation and Monitoring
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis.

4.18.4 Irreversible and Irretrievable Commitments of Public Resources

4.18.4.1 No Action Alternative
No irreversible and irretrievable commitments of public resources would occur to the health and safety of the local community as a result of the No Action Alternative.

4.18.4.2 Action Alternatives
No irreversible and irretrievable commitments of public resources would occur to the health and safety of the local community as a result of the 2021 MMP or Johnson Creek Route Alternative.

4.18.5 Short-term Uses versus Long-term Productivity

4.18.5.1 No Action Alternative
No short-term uses of public resources would occur to the health and safety of the local community as a result of the No Action Alternative beyond those already present from the legacy mine operation. Long-term positive impacts due to activities required under the ASAOC would provide some environmental improvement of long-term productivity.

4.18.5.2 Action Alternatives
The 2021 MMP and Johnson Creek Route Alternative would reclaim historically damaged stream habitat, mitigate slope stability hazards, and perform post-mining reclamation. It also would improve access to remote recreational areas. In addition, both action alternatives would make a large contribution to the Valley County economy in terms of direct and indirect employment and wages during the life of the SGP. The SGP would generate tax revenues for various levels of government. The economic benefits associated with increased employment opportunities and tax revenues could lead to continued or improved access to health services, better nutrition, and better overall well-being for the local community.
4.19 Recreation Resources

4.19.1 Impact Definitions and Effects Analysis Indicators and Methodology

Although recreation was not identified as a significant issue, it was identified by the public, the Forest Service, and cooperating agencies as a relevant consideration. The analysis of effects to recreation includes the following issue and indicators:

**Issue:** The SGP may cause changes to recreation setting, access, facilities, and/or opportunities.

**Indicators:**

- Changes in motorized access (including restrictions and/or changes in maintenance) to recreation opportunities.
- Changes in recreation physical setting characteristics and related ROS class (by season) measured in acres.
- Changes in recreation facilities (trails, campgrounds, trailheads), including the level of development and setting.
- Changes in recreation use.
- Changes in recreation opportunities available.
- Changes in the ability to participate in recreation opportunities.

For special use permits, the IOGLB website provided information regarding permitted outfitters for each IDFG, GMU, in the analysis area (the analysis area is defined in Section 3.19.2 and depicted on Figure 3.19-1).

A complete description of the assumptions made in the evaluation of the environmental consequences related to recreation is provided in the Recreation Specialist Report (Forest Service 2022m), and the environmental consequences are summarized in this chapter.

Because there are no specific recreational use and demand estimates for the analysis area, the discussion of changes to recreational use is qualitative, and describes potential changes in recreational use due to displacement, increased access, reduced acreage for recreation, and changes in the recreation setting.

Figures of existing recreation facilities under operational conditions in both the summer and winter for each alternative and routes available in both the winter and summer for the action alternatives are provided in the Recreation Specialist Report (Forest Service 2022m).

Effects on the physical ROS in the analysis area focus on two impacts: (1) identified inconsistencies with the existing designated ROS classes due primarily to changes in where motorized use would be allowed, or increased development/landscape modification with implementation of the action alternative; and (2) impacts to the estimated ROS physical setting. Almost all impacts to designated ROS classes and the estimated ROS physical setting would occur from construction through closure and reclamation. Impacts after reclamation are described for those components that may have such impacts. Impacts that would only occur during construction are noted as well.
The impacts of the SGP to recreation special use permits approved for the analysis area are also described.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

### 4.19.2 Direct and Indirect Effects

#### 4.19.2.1 No Action Alternative

Under the No Action Alternative, no construction, operation, or reclamation of the SGP components would occur. Previously approved surface exploration and associated activities on NFS lands would continue. There would be no surface (open pit) mining or ore processing to extract gold, silver, or antimony; and no underground exploration, sampling, or related operations and facilities on NFS lands. Current uses on Perpetua patented mine/mill site claims would continue, which include mineral exploration and dispersed recreation.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project (Forest Service 2015c). These approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both NFS and private lands at and in the vicinity of the SGP. The continuation of approved exploration activities at the SGP by Perpetua would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip.

In January 2021, Perpetua entered into an ASAOC with the Forest Service and EPA for removal actions at the Stibnite legacy mining site. Phase 1 of this agreement includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining wastes. Following these construction activities, the disturbed areas would be reclaimed with growth medium and revegetated to stabilize the sites. This work is planned to occur between 2022 and 2024.

**Recreation Opportunities, Facilities, Access, and Use**

Current access to the area via Johnson Creek Road and Stibnite Road would remain unimpeded. Apart from the Operations Area Boundary, existing recreation opportunities, access, and use would continue in the existing recreation setting. In the Operations Area Boundary, continued exploration and construction of the ASAOC Phase 1 remedial actions may alter the recreation setting in the immediate SGP area to have a more elevated level of the sights and sounds of humans. Some unauthorized motorized use may continue to occur off existing roads and motorized trails but would likely continue to be fairly limited in extent. In general, areas that are inaccessible to motorized vehicles would continue to be inaccessible to vehicles or certain vehicle types in summer, both limiting the motorized recreation opportunities available in some areas and preserving the setting for non-motorized recreation opportunities in these areas. Motorized winter use has expanded in recent years, and may continue to expand in the future, resulting in...
additional OSV routes, winter recreation opportunities, and additional areas receiving winter motorized use.

**Designated ROS Classes and Physical Setting**

Overall, impacts to recreation under the No Action Alternative would include modifications to the recreation setting in the Operations Area Boundary from continued surface exploration and construction equipment operation, continued low level of unauthorized motorized use, and increased winter motorized access and use. These impacts could lead to changes in the designated ROS class and/or estimated ROS physical setting (towards Semi-Primitive Motorized or Roaded Natural from Semi-Primitive Non-Motorized) of some areas due to additional motorized use both in the summer and winter. Under the No Action Alternative there would be minimal changes to the existing environment; therefore, no changes to the ROS classes and physical setting are anticipated.

**Recreation Use and Users**

Recreation activities and uses allowed under the No Action Alternative would be as described in Section 3.19.4.

**Recreation Special Use Permits**

Activities, facilities, and uses allowed under current recreation-related special use permits would continue until the end of the permit term. Changes to the recreation setting due to additional motorized use may result in shifts in the use areas for permittees, particularly for non-motorized uses such as trail rides, fishing, hunting, etc.

### 4.19.2.2 2021 MMP

**Recreation Opportunities, Facilities, Access, and Use**

**Construction and Operations**

**Operations Area Boundary Facilities**

Public use would be restricted within the Operations Area Boundary during construction, operations, and closure and reclamation by fencing near the security-monitored gates, and signs warning the public against entry into the Operations Area Boundary. Beginning at construction, approximately 13,441 acres of NFS lands (and approximately 780 acres of private patented lands within the Operations Area Boundary) would be inaccessible to dispersed recreation. For safety reasons, there would be no hunting allowed within areas posted or fenced during construction or mine operation to ensure worker safety; however, hunting may continue on public lands outside of fenced or posted Operations Area Boundary area in accordance with applicable regulations. Existing dispersed recreational use and opportunities that occur in this area would be displaced to other locations in or adjacent to the analysis area. Construction at the Operations Area Boundary would result in moderate visual contrast primarily due to the expansion of disturbance; therefore, the recreation setting would be less-natural looking compared to the existing recreation setting, especially at night. Construction noise could be heard up to 1.2 miles from the Operations Area Boundary based on noise modeling (AECOM 2019c) of the distance at which noise levels could be above 40 dBA (i.e., the lower end of the assumed baseline ambient level for wilderness
areas as discussed in Section 3.6). The distance of 1.2 miles would not extend beyond the Operations Area Boundary and would be unlikely to reduce recreation opportunities outside the Operations Area Boundary. Wildlife in the analysis area would be affected by construction noise, traffic, and activities likely resulting in displacement of wildlife to areas away from the analysis area; therefore, opportunities to participate in hunting, fishing, wildlife, and bird watching would be displaced as well, relocating use related to these activities to locations away from the Operations Area Boundary within the analysis area, or possibly outside of the analysis area. Impacts to recreation from the construction of the SGP would be major, long-term, and localized.

Helicopters used during drilling and other construction-related activities may be visible and/or audible from nearby recreation areas, including the FCRNRW, which would impact the recreation setting, particularly for wilderness users. The presence of helicopters nearby would reduce feelings of remoteness and solitude in the wilderness, potentially impacting the recreation experience of wilderness visitors. Although helicopter use would be intermittent, exploration would be ongoing; impacts would be negligible to minor, long-term, and localized.

Impacts related to reduction in acreage for recreation, described under construction for Operations Area Boundary facilities, also would apply to SGP operations, because the same lands within the Operations Area Boundary would remain inaccessible to the public during SGP operations. Impacts to recreation from SGP operations would be major, long-term, and localized.

Operation of the mine also would likely reduce recreation opportunities for the area adjacent to the Operations Area Boundary due to a change in recreation setting from increased development and noise. Operations would result in a less-natural looking and sounding recreation setting compared to the existing recreation setting and would have substantially more man-made development and activity within the Operations Area Boundary. The SGP would introduce additional modifications to the landscape similar to those present, which would further reduce the scenic integrity of the area. The SGP also would change the landscape character of the night sky by increasing sky glow or light pollution. Activities at the SGP would be visible from several recreation areas, roads, and trails including Thunder Mountain Road, Meadow Creek Lookout Road, the Meadow Creek/Summit Trailhead, and Meadow Creek Lookout. Given the closeness of the SGP to the FCRNRW boundary, portions of the FCRNRW would have unobstructed views of the SGP, including nighttime lighting, at superior viewing locations such as mountain tops or ridgelines. Based on modeling results (Forest Service 2022a), an emissions plume would be visible within the FCRNRW for up to 0.02 percent of annual daytime hours, with greater potential for plume visibility at times of low sun angle and with terrain as the viewing background, compared to sky as the background. The plume also would be visible for 2.3 to 2.9 percent of post-sunset nighttime hours (Forest Service 2022a). Presumably, if the plume would be visible within the FCRNRW, it also would be visible from other nearby NFS lands outside the Operations Area Boundary, thus affecting the recreation setting for both wilderness and non-wilderness users. Visual impacts for recreation would be negligible to minor, long-term, and regional.

Operational noise would attenuate to the threshold of 55 dBA at approximately 1.5 miles based on distance alone (blasting up to 2.2 miles) (Section 4.6), which would slightly extend past the Operations Area Boundary mainly on the east side. Wildlife in the analysis area also would be affected by operational noise, traffic, and activities, likely resulting in displacement of wildlife away from the analysis area.
Noise-related impacts from SGP operations would be moderate, long-term, and localized for normal operations, and regional for blasting.

Due to the changes in the recreation setting from SGP operations, some visitors may choose to participate in recreation opportunities elsewhere in the analysis area or the surrounding management areas where SGP operations would not be visible or audible. Impacts on recreation opportunities at and around the SGP would begin during construction and continue until the mine was decommissioned and the area reopened to dispersed recreation use. Some visitors may choose to remain at their displacement location rather than return to the SGP area due to permanent changes in the recreation setting within the Operations Area Boundary.

**Burntlog Route**

The segment of Burntlog Route near Riordan Creek and Black Lake would be within 0.5-miles of the FCRNRW border (shown on Figure 7-2d of the Recreation Specialist Report [Forest Service 2022m]). These activities may require temporary road closures and/or detours along these roads, thereby temporarily reducing access along these roadways to both sites/areas along the roadway as well as trails/areas accessed from these roads and roads/trails that cross these roadways. This temporary reduction in access also may temporarily reduce recreation opportunities along Burnt Log Road, including at the Mud Lake and Burntlog dispersed camping areas, as well as on roads/trails and in the areas accessed from Burnt Log Road, including the Pistol Lake Trailhead into the FCRNRW.

Activities related to construction of the new sections of Burntlog Route (approximately 14.9 miles) including noise, use of borrow and staging areas, temporary trailer camps, vegetation clearing, road building, and traffic, may affect the recreation setting for users within visual (2 to 3 miles east and less than 1 mile west) and audible (1 mile) distance of construction activities and facilities, including the Mud Lake dispersed camping area, Burntlog dispersed camping area, Thunder Mountain/Riordan Trailhead, Meadow Creek/Summit Trailhead, Meadow Creek Lookout, and Landmark.

Changes in the recreation setting along the Burntlog Route construction corridor (road corridor and surrounding areas) could lead to displacement of dispersed recreational use, particularly related to non-motorized activities, wilderness activities, wildlife-related recreation activities (due to wildlife displacement), and dispersed recreation camping at the Mud Lake and Burnt Log dispersed camping areas, which currently typically occur in a quieter, less-developed setting. Camping at Mud Lake would be particularly affected as construction activity would be located within 100 feet of the camping area. Construction impacts would be moderate, long-term, and localized to the Burntlog Route area and recreation facilities/areas currently accessed from the Burnt Log Road.

**Year-Round**

Use of the Burntlog Route as the primary route to the SGP during operations could result in potential displacement of motorized recreational use in the summer and winter from the existing Burnt Log Road to other roads due to the increased traffic on Burnt Log Road, and potential traffic delays and safety-related issues from mine-related traffic along the Burntlog Route. Traffic impacts are discussed in Section 4.16. Motorized public use (not including special use permit holders) of the Burntlog Route would be allowed
when the public access route through the SGP is closed, which would occur during some mining activities that would be considered public safety hazards (e.g., high wall scaling, blasting).

Use of the Burntlog Route from mine-related traffic and borrow source areas would result in increased noise and development along this route. Traffic and development would reduce opportunities for some recreation activities, particularly wildlife-based recreation activities, because wildlife would likely be displaced from the roadway area. In addition, the presence of a roadway in a previously roadless area would reduce opportunities for non-motorized activities for users that specifically prefer a roadless and/or quiet and undeveloped environment. Due to the potential increase in dispersed recreational use along the route and/or use of the Burntlog Route for mine traffic, as well as the less-natural looking and sounding recreation setting along the Burntlog Route (including nighttime lighting), some dispersed recreational users, particularly non-motorized users, may be displaced to other locations that are less noisy, used, accessible, and modified visually. Noise and visual impacts are described in Sections 4.6 and 4.20, respectively. The route would result in a moderate to strong level of visual changes, particularly for the Mud Lake and Burntlog dispersed camping areas, which would be located very close to the roadway. Impacts from noise increase and visual modifications would be major, long-term, and localized.

Wilderness users may be particularly affected by the Burntlog Route because the recreation setting, including the nighttime setting, is of great importance for wilderness experiences and the primitive recreation opportunities provided by the FCRNRW. The miles of road adjacent to the FCRNRW would increase, the setting would be altered, requiring users to penetrate farther into the wilderness to achieve a primitive setting. The portion of Burntlog Route near Riordan Creek could provide more extensive changes in the recreation setting for wilderness activities compared to existing conditions as it would be close to the FCRNRW border. This segment also could induce increased recreation use in the Black Lake area compared to existing conditions, because the roadway would be very close to this lake. Similarly, the new segment of the Burntlog Route passes very close to the FCRNRW border and may induce increased use of the wilderness area, and potentially unauthorized motorized use due to the very close proximity of the roadway to the wilderness boundary. Impacts would be moderate, long-term, and localized.

Fish adjacent to the Burntlog Route may be affected by increased sediment and could be affected if a spill were to occur (Section 4.12); therefore, there may be decreased recreational fishing success immediately along the Burntlog Route, but there would continue to be opportunities for fishing within the creeks crossed by the Burntlog Route. Operational impacts from the Burntlog Route to fishing recreation would be minor, long-term, and localized.

The 13.5 miles of the Burntlog Route would increase the area with a semi-primitive motorized recreation setting, which could increase dispersed recreation use in some areas along Burntlog Route. However, mine-related traffic could displace recreation to other locations in or adjacent to the analysis area. The Burntlog Route operational impacts to road recreation would be moderate, long-term, and localized.

**Summer**

The Burntlog Route would result in direct impacts to recreation access due to the use of a new access route. The Burntlog Route would be open to the public when other public access routes are closed. Direct impacts to recreation would include a new access route; improved access to the existing Burnt Log Road and adjacent recreation areas/facilities, including the FCRNRW and Burnt Log IRA, for a wider variety
of vehicle types, particularly low-clearance passenger vehicles; and access to areas that were previously not accessible to motorized vehicles. The Burntlog Route would increase recreation opportunities for both motorized and non-motorized uses in areas where recreation opportunities are currently limited due to limited access. The Burntlog Route also would alter recreational use in the analysis area by offering alternate locations for visitors who are displaced from the Operations Area Boundary and areas accessed off Stibnite and Thunder Mountain Roads. These impacts would primarily affect recreationists originating from Yellow Pine, and recreationists using the FCRNRW and recreation areas along the existing Burnt Log Road and new Burntlog Route. The impacts to summer recreation along the Burntlog Route would be major, long-term, and localized.

**Winter**

During construction, the Johnson Creek route would be plowed until the Burntlog Route was fully constructed. Backcountry skiers and OSV riders using Johnson Creek Road to access different areas would experience increased traffic and may be displaced. There would be a temporary groomed OSV route on the west side of Johnson Creek from Trout Creek campground to Landmark while the Burntlog Route is constructed (about 8 miles). The OSV trail on the west side of Johnson Creek from Wapiti Meadows to Trout Creek campground would be closed during construction (9 miles). To replace the Warm Lake to Landmark OSV route that would be closed from construction through reclamation, there would be a groomed OSV trail from Cabin Creek, near the Knox Ranch parking area, to the Trout Creek campground (11 miles). OSV riders would then use the route on the west side of Johnson Creek to head south to Landmark. The distance from Warm Lake to Landmark for OSV riders would increase from 8.5 miles along the Warm Lake Road route to about 19 miles. The OSV reroute adds approximately 10.5 miles to the trip from Warm Lake to Landmark.

Access would be restricted on roads and OSV routes during avalanche control. Avalanche control may make slopes in the area attractive to skiers and OSV riders due to the perception of lower risk. These paths could become more popular as ski zones if they are controlled. This could add an uncontrolled random factor into highway safety programs.

Once completed, Burntlog Route would be plowed in the winter, potentially providing additional opportunities and access for winter motorized recreation, which may result in increased winter recreational use along the Burntlog Route corridor.

Plowing of the approximately 38-mile Burntlog Route would result in the loss of 9.8 miles of infrequently groomed OSV route along the existing Burnt Log Road. Plowing of the Burntlog Route and Warm Lake Road would cutoff direct OSV access to the Horn Creek Road, Sand Creek Road, and Warm Lake Road (east/south of Landmark) OSV routes from Johnson Creek Road, which would be the only publicly available winter route to the Landmark area as Warm Lake Road would be closed to public winter use. Direct OSV access to other OSV routes could be cut off because any overland travel or OSV travel across or on the plowed Warm Lake Road and Burntlog Route would have to share the roadway with mine operation traffic also using this roadway. Therefore, it would be difficult for OSVs to connect to these OSV routes, which would limit access for OSVs, and reduce OSV opportunities and use. Lack of access to the Warm Lake Road OSV route south of Landmark also would affect access to the North Fork Sulphur Creek Road OSV route. Until the decommissioning of the Burntlog Route and reverting the
remaining road back to a groomed OSV route, winter impacts to OSV use along the Burntlog Route would be major, long-term, and localized.

Operational traffic noise and road maintenance noise in the winter would not be above ambient levels at the Thunder Mountain/Riordan Trailhead (AECOM 2019c) because the new segment of the Burntlog Route would be farther east adjacent to the wilderness boundary. Noise-related impacts would be minor, long-term, and localized.

Impacts to winter recreation opportunities, facilities, use, and access from use of the Burntlog Route during operations would focus on the Burntlog Route corridor and connecting OSV routes and would continue until the Burntlog Route was decommissioned (and therefore no longer plowed); Burnt Log Road returned to a groomed OSV route; and public access to Stibnite Road was reopened. The impacts would be major, long-term, and localized.

*Johnson Creek Route*

**Summer**

Use of Johnson Creek Road and the Stibnite Road portion of the McCall-Stibnite Road as the primary route to the SGP during the construction of the Burntlog Route could result in short-term impacts (1 to 2 years) to motorized recreation access due to potential delays, traffic, and safety-related issues from mine construction-related traffic (Forest Service 2020h; Forest Service 2022k). Access delays and traffic would affect recreation sites/areas along these roads, as well as sites and areas accessed from these roadways, including the Big Creek area. The increase in traffic and noise along these roadways also may affect the recreation setting for recreation sites and areas along these roadways, leading to a change in recreation experience for some visitors. Traffic impacts are discussed in Section 4.16. Recreation facilities potentially impacted by increased traffic and related noise along the Johnson Creek Route would include Quartz Creek and Burntlog Trailheads; Buck Mountain, Trout Creek, Ice Hole, Golden Gate, and Yellow Pine Campgrounds; Twin Bridges dispersed camping area; and Johnson Creek Cabin; therefore, the recreation setting of these facilities may be altered to a more developed setting due to a large increase in the sights and sounds of humans.

Recreationists may be displaced to avoid noise associated with construction activities and/or construction traffic along Johnson Creek and Stibnite Roads, particularly recreationists participating in non-motorized activities, as the noise of a passing heavy truck could be heard up to 0.5 mile from the road (AECOM 2019c). Wildlife-related recreation opportunities also may decrease along these roadways due to wildlife displacement from construction traffic and noise. Any displacement of dispersed recreation, reduction in recreation opportunities, or access delays would be temporary along Johnson Creek Road and Stibnite Road until construction of the Burntlog Route is completed. Due to these roads experiencing a seasonal effect which results in noticeable traffic differences, Operations Area Boundary access during construction via the Johnson Creek Route would be more impactful on summer recreational traffic on established roads. Summer construction impacts for the Johnson Creek Route would be moderate, short-term, and localized.
Winter

Currently, Johnson Creek Road is plowed 8.6 miles from Yellow Pine south to Wapiti Meadow Ranch. The remaining section of Johnson Creek Road to Landmark is a groomed OSV route, approximately 17 miles. During construction of the Burntlog Route, Johnson Creek Road would be plowed from Yellow Pine to Landmark; therefore, this road could not be used as a groomed OSV route from Wapiti Meadow Ranch south to Landmark. Plowing Johnson Creek Road would reduce the miles of groomed OSV facilities for 1 to 2 years and disrupt connections between OSV routes. To continue providing OSV access to Landmark during Burntlog Route construction, a groomed OSV route would be created adjacent to the western side of Johnson Creek Road between the proposed Cabin Creek Road groomed OSV route and Landmark and maintained until construction activities are completed.

Once the Burntlog Route is constructed, Johnson Creek Road would revert to a groomed OSV route from Wapiti Meadow Ranch to Landmark. The change in location of the groomed OSV route along Johnson Creek Road from the roadway to the western side of the road for approximately seven miles would not be expected to alter recreational use of this route, although temporary use of Johnson Creek Road for mine access during construction of the Burntlog Route may alter recreation experiences for motorized users due to increased traffic along the roadway, leading to displacement of some users.

The plowing of Johnson Creek Road would provide additional motorized access and winter recreation opportunities along this road, thereby potentially increasing winter recreational use along this road. However, plowing and construction traffic on Johnson Creek Road and Warm Lake Road (described below) and the location of the temporary groomed OSV route along the western side of Johnson Creek Road may make it difficult and/or unsafe for OSV’s to cross Johnson Creek Road or Warm Lake Road to reach other OSV routes in the Landmark area, resulting in reduced OSV opportunities and use. Impacts would be focused on the Johnson Creek Road corridor and would cease when the Burntlog Route is completed and plowing of Johnson Creek Road has ceased.

Due to the plowing of Johnson Creek Road during the construction of the Burntlog Route, OSV access to Ditch Creek Road would not be feasible on Johnson Creek Road from the south; therefore, access and use of the two-mile Ditch Creek Road OSV route would be greatly reduced, because the route would be cut off from other OSV routes until construction of the Burntlog Route was completed, and Johnson Creek Road reverted to a groomed OSV route. Impacts would begin with construction and end with completion of the Burntlog Route and plowing of Johnson Creek Road has ceased.

Winter driving conditions influence the amount of traffic on Johnson Creek Road and result in lower AADT levels during the winter months. The seasonal effect of traffic on this road would show a noticeably greater increase in mine-related winter traffic (i.e., drivers would notice a higher ratio of mine-related traffic to general traffic) during construction which could impact user experience. Winter construction impacts for the Johnson Creek Route would be minor, short term, and localized.

Warm Lake Road

Summer

Impacts to recreation access, opportunities, settings, experiences and use from mine construction traffic use of Warm Lake Road would be similar to those described above for the Johnson Creek Route;
however, Warm Lake Road would have a less substantial increase in traffic compared to Johnson Creek Road (discussed further in Section 4.16). Recreation facilities potentially impacted by increased traffic and related noise along Warm Lake Road include Big Creek Summit and Bear Creek/Warm Lake trailheads, as well as Summit Lake, Warm Lake, and SFSR campgrounds. Impacts to recreation access, opportunities, settings, experiences and use along Warm Lake Road would begin during construction and would continue due to increased traffic through operations and closure/reclamation. Summer construction impacts to Warm Lake Road would be minor, short term, and localized.

Winter

Approximately 11 miles of existing groomed OSV route from Warm Lake to Landmark on Warm Lake Road would be closed during construction due to plowing of Warm Lake Road as an Operations Area Boundary access road. To continue providing OSV access to Landmark, a 10.4-mile groomed OSV route between Warm Lake and Trout Creek Campground on Cabin Creek Road would be created along with a parking area, resulting in a new winter access facility that would be maintained by Valley County. This route has greater potential (40 percent higher) for avalanche hazards than the currently used OSV route between Warm Lake to Landmark (DAC 2021). From Trout Creek Campground, OSV users could continue down Johnson Creek Road to Landmark on a groomed OSV route. The new 10.4-mile groomed OSV route along Cabin Creek Road may lead to dispersed winter recreational use along this new route because the route would provide winter recreation opportunities in an area that currently does not have many due to lack of access. The new Cabin Creek OSV route would be the only available easterly OSV route to Landmark; however, the portion of Warm Lake Road that would be plowed to Landmark would be open to the public year-round, allowing recreationists greater vehicular access east of Warm Lake. Impacts to winter recreation access, opportunities, and use would be focused on Warm Lake Road (existing OSV route portion); the new OSV route corridor along Cabin Creek Road; and the Landmark area. Winter recreation impacts to Warm Lake Road during construction would be minor, short term, and localized.

Public Access

During construction (prior to the completion of the Burntlog Route) access through the Operations Area Boundary would continue, but there may be half-day to multiple day road closures of Stibnite Road and Thunder Mountain Road. Impacts to recreation along Stibnite Road and Thunder Mountain Road through the Operations Area Boundary would begin at the start of construction and continue until a public access road is constructed. During the summer, temporary closure of these roads could increase travel time to access recreation areas and sites farther east on Thunder Mountain Road. Change in access to Thunder Mountain Road would change how recreationists access recreation facilities, including the Monumental Summit Interpretive Site, the Monumental Trailhead, the Lookout Mountain/Thunder Mountain Trailhead, the Idaho Centennial Trail, other dispersed recreation areas in the FCRNRW, and portions of the Meadow Creek, Sugar Mountain, and Horse Heaven IRAs via Stibnite Road. Recreational use and opportunities in these areas/sites would be reduced in the summer due to reduced access during road closures. Impacts would be moderate, temporary, and localized to Stibnite Road, Thunder Mountain Road, and areas/sites accessed from these roads. Closure of Stibnite and Thunder Mountain roads would affect recreationists that typically access areas/sites via roads near the village of Yellow Pine, and recreationists that use these roads/areas in the winter. Impacts to recreation access, use, and opportunities
Secure areas within the Operations Area Boundary would be restricted from general public access and would be off limits to hunting by employees, thereby closing some areas to hunting and recreational shooting; however, the area is currently rarely used by hunters and recreational shooters. Impacts would be negligible, long term, and localized within the Operations Area Boundary.

After construction of the Burntlog Route and as part of public access control within and in the vicinity of the Operations Area Boundary, about 4.7 miles of Stibnite Road and 5.4 miles of Thunder Mountain Road would be closed to public use, but a new public access road through the Operations Area Boundary would be constructed. However, the public would not be able to reach the Stibnite Mining District Interpretive Site within the Operations Area Boundary, effectively closing this site to the public throughout operations. Impacts would be localized to just the interpretive site and would begin with the completion of Burntlog Route and conclude after closure and reclamation. These impacts are anticipated to be minor, long term, and localized.

During periodic closures of the road through the Operations Area Boundary, recreation areas and sites beyond the Operations Area Boundary accessed from Stibnite and Thunder Mountain roads would be available via the new Burntlog Route. Using the Burntlog Route would result in a long detour for recreationists traveling from Yellow Pine to Monumental Summit, Thunder Mountain Road, and Meadow Creek lookout. There could be a decrease in summer and winter use of the impacted sites/areas, even with the Burntlog Route, if displaced recreationists decide to forego visiting these destinations due to added travel time. Impacts are anticipated to be moderate, long term, and localized.

During mine operations, public access would be allowed through the Operations Area Boundary via a 12-foot gravel road that connects Stibnite Road to Thunder Mountain Road. This road would be open to all vehicles year-round but would not be plowed during the winter. Because the road would be within the Operations Area Boundary, there would be no public use allowed off the road; the road would be for public access to the recreation sites/areas accessed via Thunder Mountain Road. The public access road through the Operations Area Boundary would return access to these recreation sites/areas after Stibnite Road is no longer available. In addition, the public access road would allow visitors from Yellow Pine to reach the Thunder Mountain Road sites/areas substantially faster than taking the Burntlog Route, which may result in less displacement of use at these sites/areas during operations. For visitors that pass through the Operations Area Boundary on the public access road, the recreation setting would be very developed and substantially modified; however, this would likely be expected, because the road would be passing through the active Operations Area Boundary. Although the public access road would return access to recreation sites/areas accessed via Thunder Mountain Road, there would be temporary closures of this route during some mining activities that would be considered public safety hazards (e.g., highwall scaling, blasting). When such road closures would occur, the closures would result in reduced access to recreation sites/areas off Thunder Mountain Road; reduced recreation opportunities and use due to a lack of access; and impacts to recreation experiences due to visitor expectations regarding site/area availability. Impacts from road closures would affect recreation sites/areas off Thunder Mountain Road and may ultimately lead to continued displacement of visitors from the Thunder Mountain Road sites/areas. Impacts would persist throughout operations and closure and reclamation until a relocated Stibnite Road was available to
the public, and the mine access road was decommissioned. Impacts are anticipated to be moderate, short term, and localized.

**Burntlog Maintenance Facility**

Construction of the maintenance facility may require temporary road closures and/or detours along Burnt Log Road, thereby temporarily reducing access to recreation sites and areas along this roadway and trails/areas accessed from this road. Impacts from construction of the Burntlog maintenance facility would be localized, temporary, and minor.

Noise associated with construction activities could reduce opportunities for noise-sensitive recreation activities at and around the maintenance facility location, including wildlife-related recreation activities, because wildlife may be displaced. Noise from construction activities related to the Burntlog Maintenance Facility would be above ambient levels (40 dBA) at the Mud Lake dispersed camping area (AECOM 2019c); some recreationists may choose to visit other areas or sites to avoid delays or noise from construction activities. Any reduction in recreation opportunities, displacement of dispersed recreational use, or changes in access would be temporary until maintenance facility construction was completed. Impacts would be moderate, temporary, and localized to the area surrounding the maintenance facility and the roads/trails accessed from Burnt Log Road.

Development of the Burntlog Maintenance Facility would reduce recreation opportunities due to physical removal of acreage for the facility (3.5 acres). Impacts from operational traffic and road maintenance activities, and associated noise, are included in the impacts from the Burntlog Route, which would occur immediately adjacent to this facility. Operational noise at the maintenance facility itself could reduce opportunities for some recreation activities in this area, particularly wildlife-related recreation activities because wildlife may be displaced from the area. The maintenance facility would increase man-made effects in the area surrounding the facility, including nighttime lighting. These changes may affect the recreation setting of this general area by decreasing the feeling of remoteness, thereby affecting the recreation experience for visitors. Impacts would generally be limited to the area within visual and audible distance of the maintenance facility, would begin once the facility was operational and conclude once the facility was closed and reclaimed. Impacts are anticipated to be minor, long term, and localized.

**Communications Facilities**

A 60-foot-tall cell tower site would be constructed within the Operations Area Boundary but would not result in additional recreation-related impacts besides those discussed above for construction of Operations Area Boundary facilities. Impacts would begin during construction and would conclude with construction of the cell tower; impacts to recreation would be negligible, temporary, and localized.

The cell tower would not be visible to recreationists in the FCRNRW but would be visible from portions of Thunder Mountain Road. New cellular coverage along the Burntlog Route and on other NFS lands in the analysis area would increase visitor safety; however, additional cellular coverage would detract from primitive recreation experiences. Impacts would begin once the cell tower was constructed and would conclude with closure and reclamation of the site. Impacts are anticipated to be minor, long term, and localized.
In addition, a series of 10-foot-tall repeaters would be constructed on 3-foot by 3-foot concrete pads. Sites within the Operations Area Boundary would not result in additional construction impacts besides those discussed above for construction of the Operations Area Boundary facilities. Construction of repeaters at the Burntlog Maintenance Facility would not result in additional construction impacts besides those discussed above for the Burntlog Maintenance Facility. Construction of the repeaters at the Meadow Creek and Thunderbolt Lookouts could interfere with hiking use in the lookout area and construction activities may affect the recreation setting for users within visual and audible distance of construction activities and facilities. Given their locations at existing or proposed facilities, no additional disturbance for equipment installation or access would be required for their construction and maintenance. Impacts to recreation from the construction of these pad sites would be minor, temporary, and localized.

Changes in the recreation setting along access routes and repeater sites could lead to displacement of dispersed recreational use, particularly related to non-motorized activities, and wildlife-related recreation activities (due to wildlife displacement), which typically occur in a quieter, less-developed, and non-motorized setting. Impacts would be minor, temporary, and localized to the access route and repeater site and would begin during construction and conclude once construction is completed.

Due to the small size of the repeater sites, locations within the Operations Area Boundary would not be visible to recreation areas outside the boundary, including the FCRNRW, and therefore would not affect the recreation setting. Repeaters at the Burntlog Maintenance Facility would be included in the general recreation setting impacts described above for the maintenance facility. Repeater sites at the Meadow Creek and Thunderbolt Lookouts could interfere with hiking use in the lookout area and may affect the recreation setting for users within visual distance of them. Repeater facilities would assist with reducing the risk of vehicle collisions on the Burntlog Route by providing increased communications, and may accelerate accident response, which would provide benefits to recreation visitors along the Burntlog Route. Impacts would begin once the repeaters were constructed and would conclude with closure and reclamation of these sites. Impacts are anticipated to be minor, long term, and localized.

**Transmission Line and Associated Facilities**

Transmission line upgrades along Warm Lake Road, Johnson Creek Road, and Cabin Creek Road could result in temporary road detours or delays as a result of construction activities and traffic along these roads. There could be temporary delays in accessing other roads, trails, and facilities along these roadways, which could adversely affect the recreation experience for some recreationists. Impacts from construction would be minor, short term, and localized.

A portion of the transmission line would be re-routed near Thunder Mountain Estates to be along the Warm Lake Road ROW and the edge of NFS and State lands. The re-routed portion along the road would not be in a recreation area. Noise associated with construction of the portion along the NFS and State lands could reduce opportunities for more noise-sensitive recreation activities along the corridor, including wildlife-related recreation activities, because wildlife may be displaced. Impacts would be minor, temporary, and localized.

A motorcycle trail (Eagle Nest) on the NFS lands intersects the re-routed location of the upgraded transmission line. Construction of the upgraded transmission line in this location may result in delays or
detours accessing this trail. The re-routed segment of the transmission line could adversely affect the recreation experience for users of this trail compared to existing conditions. Some recreationists may choose to visit other areas or trails to avoid delays or noise from construction activities. Any reduction in recreation opportunities, displacement of dispersed recreation use, or changes in access would be temporary until the transmission line was completed. Impacts would be minor, temporary, and localized to the Thunder Mountain Estates re-route section of the transmission line.

Noise from transmission line upgrade construction activities and/or utility access spur road construction activities may be above ambient levels (above 40 dBA) at the Big Creek Summit Trailhead, Cabin Creek/Thunderbolt Trailhead, Trout Creek/Thunderbolt Trailhead, Trout Creek Campground, Twin Bridges dispersed camping area, Ice Hole Campground, and SFSR Campground (AECOM 2019c). The Ice Hole and Trout Creek Campgrounds in particular would have more construction noise impacts due to their close proximity to the transmission line. Impacts from construction-related noise would be moderate, temporary, and localized to the campgrounds.

Construction activities would not occur at night, and therefore would not affect overnight camping, but may affect the setting of campgrounds during the day, particularly at the Ice Hole and Trout Creek campgrounds, and Twin Bridges dispersed camping area where construction activities would be visually or audibly evident. Some recreationists may choose to visit other areas or roads, or access facilities/trailheads from other roads to avoid delays or noise from construction activities. Impacts from a reduction in recreation opportunities, displacement of dispersed recreational use, or changes in access would be moderate, short term, and localized until transmission line upgrades are completed.

Transmission line upgrades between Cascade and Donnelly also may lead to short-term road detours or delays at Stonebreaker Lane and Loomis Lane, which provide access to Sugarloaf Campground and Boulder Creek Day Use Area, respectively, at Lake Cascade. Such delays could adversely affect the recreation experience for some recreationists. Both recreation sites are over 0.5 mile from the transmission line and, therefore, would likely not be affected by construction noise or visibility of construction activities; however, road delays or detours may result in some recreationists choosing to visit other recreation sites at the lake. Impacts to recreation during the transmission line upgrades, particularly as a result of road delays and detours between Cascade and Donnelly would be moderate, short term, and localized.

The upgraded transmission line would be wider and taller (by 30 feet) with an expanded ROW and may become more noticeable in the recreation setting, particularly for recreationists at campgrounds along Johnson Creek Road and at the SFSR Campground near Warm Lake Road, due to the static views of recreationists from these locations. The recreation setting of the SFSR, Trout Creek, and Ice Hole Campgrounds, and Twin Bridges dispersed camping area could be affected by the upgraded transmission line. In addition, the re-routed portion of the transmission line along the NFS and State lands around the Thunder Mountain Estates, would alter the recreation setting of these lands, and the motorcycle trail that leaves from Warm Lake Road on the NFS lands in this area. The new transmission line in this area would result in a more developed recreation setting for these lands, trails, and camping facilities; however, dispersed users and motorcyclists would generally be able to move away from the transmission line and this change in the recreation setting may not greatly influence their recreation experience. This change in recreation setting would affect recreation experiences and may result in some recreationists choosing to
visit other campgrounds or dispersed camping areas with a less-developed setting either within the analysis area or adjacent to the analysis area. The larger transmission line facilities also would affect the recreation setting for dispersed recreation areas along Warm Lake Road, Johnson Creek Road, and Cabin Creek Road. Dispersed recreation users, including those at trail and trailhead facilities from which the upgraded transmission line would be visible, would be able to move away from the transmission line; therefore, this change in the recreation setting may not influence their recreation experience to the same extent. Impacts would be negligible to moderate, permanent, and localized.

Transmission line construction activities may result in temporary road detours or delays in accessing other trails/areas from Horse Heaven Road. Such delays could adversely affect the recreation experience for some recreationists, specifically, access to and use of the Riordan Trailhead on Horse Heaven Road that provides access to FT 097, which leads to Riordan Lake, a popular fishing location. Impacts to this trailhead could result in a reduction in recreation opportunities from this trailhead and temporary decrease in use of this trailhead. Noise associated with construction activities could reduce opportunities for noise-sensitive recreation activities along the transmission line corridor (for a distance of 0.6 to 1 mile) (AECOM 2019c), including wildlife-related recreation activities, because wildlife may be displaced. Noise from transmission line construction activities may be above ambient levels (above 40 dBA) at the Meadow Creek Lookout and Riordan Trailhead (AECOM 2019c); therefore, some recreationists may choose to visit other areas or trails to avoid delays or noise from construction activities. Displacement of dispersed recreational use, reduction in recreation opportunities, or changes in access would be until the transmission line was constructed. These impacts would be minor, temporary to short term, and localized to the transmission line corridor.

The new transmission line to the Operations Area Boundary would reduce recreation opportunities due to physical removal of acreage for transmission line facilities (approximately 101 acres). Although recreation could still occur underneath the transmission line, the recreation setting would change due to the increased presence of man-made development and the clearing of existing vegetation along the ROW. Trail FT 233 would be upgraded for use as a transmission line access road, which would make the trail passable for a wider range of vehicles, resulting in impacts to recreation access, and potentially new recreation opportunities and use, due to increased access. The upgraded FT 233 would connect to trail FT 097 and Horse Heaven Road. Impacts from the transmission line and associated access roads would begin when the portion of the transmission line road on FT 233 was open to the public, and end with closure and reclamion of the transmission line and access road, and FT 233 improvements were removed. These impacts are anticipated to be moderate, long term, and localized.

The Johnson Creek substation would be located along Johnson Creek Road approximately 0.8 mile south of the Johnson Creek airstrip. Construction of the substation would result in impacts similar to those described for transmission line upgrades, including potential delays accessing Johnson Creek Road and the areas and sites along this road, which could affect the recreation experience for some users. Noise associated with construction of the substation could reduce opportunities for noise-sensitive recreation activities, including wildlife-related activities, because wildlife may be displaced from the area around the substation. Construction activities at the substation would not be expected to affect physical use (landing/taking off) at the airstrip; however, construction noise may affect the recreation experience for some users. These impacts would be minor, temporary to short term until construction of the substation is complete, and localized.
The Johnson Creek substation would reduce recreation opportunities due to physical removal of acreage for the substation (1.1 acre); therefore, dispersed recreational use that may occur at this location would be displaced to other locations in the analysis area. The substation also would increase man-made development in this area of Johnson Creek Road and may affect the recreation setting of the nearby Johnson Creek airstrip, because flyers could see the substation as they approach the airstrip. This may decrease the feeling of remoteness when flying into the airstrip, thereby affecting the recreation experience for airstrip visitors. Impacts would be limited to the area within visual distance of the substation and would begin once the substation was constructed. Impacts are anticipated to be minor, long term, and localized.

Closure and Reclamation

*Operations Area Boundary Facilities*

Impacts to recreation during closure and reclamation of the mine would be the same as those described for construction.

If wildlife does not re-populate the Operations Area Boundary after reclamation, there would be a reduction in wildlife-related recreation opportunities. Fish species composition and/or relative populations within the creeks in the SGP area may change after reclamation, as anticipated habitat may favor steelhead over Chinook salmon, and there would be a decrease in habitat for bull trout and westslope cutthroat trout and Chinook salmon. Therefore, fishing opportunities may be altered after reclamation as well (Section 4.12).

Though nighttime lighting would cease post-mine reclamation, the Operations Area Boundary would have a less natural looking recreation setting compared to the existing recreation setting and would have substantially more man-made development present that would be noticeable to visitors because the Operations Area Boundary access road would require visitors to pass over and next to former Operations Area Boundary facilities that would dominate the setting. Reclaimed facilities would be visible from portions of the FCRNRW at superior viewing locations, such as mountain tops or ridgelines, as well as from the Meadow Creek/Summit Trailhead and Meadow Creek Lookout. It would take a long time for the Operations Area Boundary to fully revegetate and vegetation that grows may not resemble the structure and density of existing vegetation (e.g., timber), and the landscape for humans may never return to existing levels, permanently altering the recreation setting of the Operations Area Boundary. Although some dispersed recreation use may return to the Operations Area Boundary after reclamation, due to the changes in the recreation setting, some visitors may choose to participate in recreation opportunities elsewhere in the analysis area or the surrounding management areas where the recreation setting is more natural. Overall, impacts to recreation would occur during closure/reclamation, and would continue after reclamation was completed and would be long term to permanent, localized, and minor.

*Burntlog Route*

Impacts during the two-year decommissioning of the Burntlog Route would be the same as those described for construction. In addition, there could be substantial traffic on the Burntlog Route until decommissioning, resulting in traffic-related impacts to recreation described under Operations. Noise from decommissioning of the Burntlog Route would be above ambient levels (40 dBA) within portions of
Once decommissioned, year-round operational impacts from the route would cease. Impacts from reclamation are anticipated to return to the baseline conditions.

Although the width of 20 miles of Burnt Log Road would be reduced, the retention of flatter grades and gentler curves may allow continued access on this road by a wider variety of vehicle types. Therefore, impacts to access on Burnt Log Road may continue after decommissioning. Related increased recreational use of existing recreation facilities and areas along this road (e.g., trails, trailheads, Mud Lake dispersed camping area, Burntlog dispersed camping area) also may continue past decommissioning. Although the new roadway would be recontoured and seeded, it would take many years for trees (20 or more years) to appear as natural vegetation in these areas. In addition, 1.5 miles of soil nail walls would remain for stabilization purposes along the roadway after decommissioning. Therefore, the recreation setting in this area would likely appear disturbed for a long time. Due to the closeness of the FCRNRW to the Burntlog Route new roadway, this modified recreation setting could detract from the recreation setting for some forest visitors and require users to go farther to achieve a semi-primitive non-motorized or primitive recreation setting. Potential impacts to recreation from the reclamation activities are moderate, long term, and localized.

**Public Access After Reclamation**

Public access through the Operations Area Boundary after reclamation/closure would be on a reopened Stibnite Road, which would include a permanent road through the backfilled Yellow Pine pit. Access to recreation sites/areas off Stibnite Road and Thunder Mountain Road would no longer be via the Burntlog Route, which would be decommissioned, but would be via a reopened and reclaimed Stibnite Road. Reopening Stibnite Road would reverse the impacts described under operations. Impacts to recreation access, opportunities, and use from public access through the Operations Area Boundary via a reopened Stibnite Road would continue beyond closure and reclamation and are anticipated to be moderate, long term to permanent, and localized.

**Burntlog Maintenance Facility**

As part of closure and reclamation, the Burntlog Maintenance Facility would be removed, the site graded, and drainage would be reestablished. The site would be seeded and become available for public recreational use following reclamation. Impacts to recreation during decommissioning would be the same as those described for construction. Once the facility was closed and the site was reclaimed by vegetation, operational impacts related to loss of acreage for recreation and changes to the recreation setting of the general area surrounding the facility would cease. These impacts would be minor, temporary, and localized to the area surrounding the maintenance facility, and the roads/trails accessed from Burnt Log Road.
Communications Facilities

Impacts from closure and reclamation of the cell tower site would not result in additional impacts besides those discussed above for closure and reclamation of Operations Area Boundary facilities. The reduction in cellular coverage in portions of the analysis area near the SGP area and along the Burntlog Route would be the same as existing conditions after the cell tower is removed. The loss of cellular coverage would aid in returning primitive recreation experiences to the FCRNRW areas adjacent to the Burntlog Route and the Operations Area Boundary. Impacts after reclamation and closure would return to the pre-mining conditions.

Reclamation of repeater sites would not result in additional impacts besides those discussed above for closure and reclamation of Operations Area Boundary facilities. Reclamation of repeaters at the Burntlog Maintenance Facility would not result in additional impacts besides those discussed above for the Burntlog Maintenance Facility. Reclamation of repeater sites at the Meadow Creek and Thunderbolt Lookouts would result in the same impacts as those described for construction and are anticipated to be permanent, localized, and negligible.

Transmission Line and Associated Facilities

The upgraded transmission line from Lake Fork to Johnson Creek substation would be retained and used by IPCo. The associated facilities along the upgraded transmission line (i.e., switching station, substations) would remain in place and would not be decommissioned; impacts described under Operations for the upgraded transmission line would remain after mine closure, which include impacts to the recreation setting and recreation experiences.

The new transmission line, transmission line access roads, and metering station at the Operations Area Boundary would be decommissioned. Impacts during decommissioning would be the same as those described for construction. Once the transmission line is removed, operational impacts would cease, including loss of physical acreage for recreation, and trail access, use, and opportunities for a wider range of vehicles due to road improvements.

Designated ROS Classes and Physical Setting

Operations Area Boundary Facilities

During construction, operations, and closure/reclamation, public recreation would not be allowed within the Operations Area Boundary. Public closure of this area would not result in inconsistencies with the existing ROS designation classes within the Operations Area Boundary during construction, operations, and reclamation/closure. Figures 3.19-2 and 3.19-3 show the Estimated Physical Setting for summer and winter under the 2021 MMP and additional discussion is provided in the Recreation Specialist Report (Forest Service 2022m). The anticipated acres of disturbance within each ROS physical setting are also provided in the Recreation Specialist Report (Forest Service 2022m). Due to setting alterations during construction, operation and mine closure and reclamation, the Operations Area Boundary post-reclamation may be inconsistent with Roaded Natural and Semi-Primitive Non-Motorized designations and could be more consistent with a Roaded Modified designation; therefore, impacts are anticipated to be moderate, long term, and localized.
The recreation setting would be changed from construction, mine operations, and closure/reclamation. The existing estimated ROS physical setting class within the Operations Area Boundary would be altered to Roaded Natural but would be consistent with the existing estimated ROS physical settings of Rural and Roaded Natural; therefore, no impact to the ROS designations is anticipated.

Public Access After Reclamation

Public access through the Operations Area Boundary would be located in an area currently designated as Roaded Natural, which allows for some landscape modification from roads, and a ROS physical setting of Rural, which allows for strong evidence of designed roads; therefore, public access through the Operations Area Boundary after closure and reclamation would not result in inconsistencies with the existing ROS designation or the estimated ROS physical setting. No impacts to the ROS designations are anticipated.

Burntlog Route

**Summer**

The Burntlog Route would decrease remoteness and increase the evidence of humans along the roadway; in particular, along the new roadway segments. The Burntlog Route in areas designated as Roaded Modified and Roaded Natural would not result in inconsistencies with the existing ROS designation classes because they already account for landscape modification from roads. An approximately 10-acre portion of the Burntlog Route is currently designated as Semi-Primitive Non-Motorized so it would be more consistent with a designation of Roaded Natural. This impact would occur from construction and would continue after closure and reclamation of the road due to the length of time it would take for the road to return to a natural-appearing condition. Therefore, impacts are anticipated to be minor, long term to permanent, and localized.

The existing estimated ROS physical settings of Semi-Primitive Motorized and Semi-Primitive Non-Motorized along the Burntlog Route (Figure 3.19-2) would be altered to Roaded Natural. The Burntlog Route would increase the evidence of humans along the route due to the large amount of mine traffic that would be present on the road. There are a few areas where presence of the new roadway would alter an area near the roadway from an existing estimated ROS physical setting of Semi-Primitive Non-Motorized to Semi-Primitive Motorized or Primitive to Semi-Primitive Non-Motorized due to a decrease in remoteness. The Burntlog Route in areas with an existing estimated ROS physical setting of Roaded Natural would not result in inconsistencies with this setting; therefore no impact to the ROS designations is anticipated.

**Winter**

The Burntlog Route would be plowed, and the area surrounding plowed roads is typically designated as Roaded Natural or Rural in the winter. The Burntlog Route alignment including the existing Burnt Log Road and unroaded areas is currently designated as Semi-Primitive Motorized in the winter; therefore, plowing the Burntlog Route including the 9.8 miles of infrequently groomed OSV route would be more consistent with a designation of Roaded Natural. This impact would occur from construction through closure and reclamation. After closure and reclamation of the route, plowing would end; therefore, the
route would not continue to be inconsistent with the existing ROS designation and impacts would no longer be anticipated.

In the winter, the Burntlog Route area has an existing estimated ROS physical setting of Semi-Primitive Motorized (Figure 3.19-3). Although the setting of the route would become less remote and the evidence of humans would be more noticeable, the road would still be in a fairly remote area away from other plowed routes or groomed snowmobile routes. The setting would not change enough to be considered Rural and impacts are anticipated to be negligible, long term, and localized.

**Johnson Creek Route**

**Summer**

The areas surrounding roads that would be used as part of the Johnson Creek Route are currently designated as Roaded Natural with an existing estimated ROS physical setting of Roaded Natural and Rural (Figure 3.19-2); therefore, increased traffic on these roads as part of construction would not result in inconsistencies with the existing ROS designation surrounding the roads. No impact to the ROS designations is anticipated.

**Winter**

During construction of the Burntlog Route, Johnson Creek Road from Wapiti Meadow Ranch to Landmark would be plowed and as currently occurs, Stibnite Road from Yellow Pine to the Operations Area Boundary would be plowed. The area surrounding plowed roads is typically designated as Roaded Natural or Rural in the winter, with an estimated physical ROS setting of Roaded Natural (Figure 3.19-3). The area along Johnson Creek Road south of Wapiti Meadow Ranch is currently designated as Semi-Primitive Motorized in the winter. In the winter, the area along Stibnite Road is designated as Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Modified and Roaded Natural. Therefore, plowing 6.7 miles of Johnson Creek Road and existing and continued plowing of Stibnite Road would be more consistent with a designation of Roaded Natural and the physical setting of the area surrounding this road would be altered to Rural due to closeness to other plowed routes (only during the winter months). This impact would end once the Burntlog Route was operational. Creating a temporary groomed OSV route just west of Johnson Creek Road (due to the plowing of the road) would not be inconsistent with the existing winter ROS designation of Semi-Primitive Motorized surrounding Johnson Creek Road. No impact to the ROS designations is anticipated. Impacts to the estimated physical ROS setting are anticipated to be minor, short term, and localized.

**Warm Lake Road**

**Summer**

The area surrounding Warm Lake Road is currently designated as Roaded Natural and Rural with an existing estimated ROS physical setting of Rural (Figure 3.19-2); therefore, increased traffic on this road would not result in inconsistencies with the existing ROS designations. No impact to the ROS designations is anticipated.
Winter

Warm Lake Road from Warm Lake to Landmark would be plowed; however, this section of road is currently a groomed OSV route and is in an area designated as Semi-Primitive Motorized in the winter. Plowing Warm Lake Road from Warm Lake to Landmark would be more consistent with a designation of Roaded Natural and is within an area with an estimated ROS physical setting of Semi-Primitive Motorized (Figure 3.19-3). Plowing this portion of Warm Lake Road would alter the estimated ROS physical setting of the area surrounding this portion to Rural in the winter because it would be adjacent to other plowed routes. Impacts to ROS designations would occur from construction through closure and reclamation and are anticipated to be minor, long term, and localized.

A new groomed OSV route along Cabin Creek Road from Warm Lake to Trout Creek Campground would be created along with a parking area in the Warm Lake area and would be in an area currently designated as Semi-Primitive Motorized in the winter, which is typically what the area around a groomed OSV trails is designated; therefore, the new groomed OSV route would not result in inconsistencies with the existing ROS designation class. The parking area would be located in an area currently designated as Roaded Natural and an estimated ROS physical setting of Rural; therefore, there would be no inconsistencies with the existing ROS designation class and no alterations of the estimated ROS physical setting. No impact to the ROS designations is anticipated.

Closure of Stibnite and Thunder Mountain Roads Through the Operations Area Boundary

Closure of these road portions during construction would not result in inconsistencies with the existing ROS designation class or the estimated ROS physical setting (Rural and Roaded Natural) of the area surrounding either road; therefore, no impact to the ROS designations is anticipated.

Road Through Operations Area Boundary

Public access through the Operations Area Boundary would be located in an area currently designated as Roaded Natural and an existing estimated ROS physical setting of Rural. These designations allow for some landscape modification from roads and strong evidence of designed roads, respectively; therefore, public access through the Operations Area Boundary would not result in inconsistencies with the existing ROS designation or estimated ROS physical settings. No impacts to the ROS designations are anticipated.

Burntlog Maintenance Facility

The Burntlog Maintenance Facility would be in an area currently designated as Roaded Modified, which can have modifications that are visually subordinate to viewers, and an existing estimated ROS physical setting of Rural; therefore, the maintenance facility in this area would not result in inconsistencies with the existing ROS designation class or estimated ROS physical setting during use or after reclamation. Impacts are not anticipated.

Communications Facilities

Impacts to existing ROS designations at the Operations Area Boundary are discussed above and would be the same for the cell tower and several of the repeater sites. Impacts to the existing ROS designation from adding a repeater site at the Burntlog Maintenance Facility would be the same as described above.
for such facility. A repeater site at the existing Meadow Creek Lookout or the old Thunderbolt Lookout would not result in inconsistencies with the existing ROS designation classes (Roaded Natural and Roaded Modified) or the estimated ROS physical setting (Roaded Natural) for these areas as modifications are allowed during use and after reclamation. A repeater site at the Trapper Creek/Burnt Log Road intersection, currently with a ROS designation class of Roaded Modified and an estimated ROS physical setting of Roaded Natural, would not result in inconsistency with the existing ROS designations during use or after reclamation as some landscape modification is allowed. Impacts are not anticipated.

Transmission Line and Associated Facilities

The transmission lines to be upgraded along Warm Lake Road, Cabin Creek Road, and Johnson Creek Road are in areas currently with ROS designations of Roaded Modified and Roaded Natural and estimated ROS physical settings of Rural, Semi-Primitive Motorized, and Roaded Natural, respectively. Upgrades to these transmission lines would not result in inconsistencies with the existing ROS designation classes or the estimated ROS physical settings in the transmission line ROWs because these classifications allow moderate evidence of the sights and sounds of man; therefore, impacts are not anticipated.

The new transmission line and access road in PNF MA 13 would be in an area with a ROS designation of Semi-Primitive Non-Motorized and an estimated ROS physical setting of Semi-Primitive Motorized and Semi-Primitive Non-Motorized. Allowing motorized use for transmission line construction and maintenance along the new access roads would be more consistent with a long-term designation of Semi-Primitive Motorized or Roaded Natural until the transmission line is decommissioned. The potential change of designation from Semi-Primitive Non-Motorized to Semi-Primitive Motorized or Roaded Natural would affect an area of approximately 47 acres. Impacts are anticipated to be minor, long term, and localized.

The new transmission line and access road in BNF MA 21 would be in areas currently designated as Roaded Modified, which is a subclassification of Roaded Natural, where there is more landscape modification (i.e., roads, management activities) than under Roaded Natural, but not enough modification to qualify as Rural. Creation of the transmission line and associated road in this classification would not result in inconsistencies with the existing ROS designation class for the transmission line ROW in BNF MA 21 and impacts are not anticipated.

The new substation would be located in an area along Johnson Creek Road currently with a ROS designation as Roaded Modified and an existing estimated ROS physical setting of Roaded Natural and would not result in inconsistencies with the existing ROS designations as the existing class and physical setting allows for moderate evidence of the sights and sounds of man. Impacts are not anticipated.

Recreation Use and Users

Impacts to Developed Recreation sites are discussed above for Recreation Opportunities, Facilities, Access, and Use. Dispersed recreation would continue to occur throughout the analysis area. Potential impacts to dispersed recreation including hunting, fishing, mountain biking, recreational river use, horseback riding, hiking, and winter use would include potential access delays to areas from construction and mine traffic. These potential delays would be minor, short term to-long term, and localized. In
addition, approximately 13,441 acres of NFS lands and approximately 780 acres of private patented lands within the Operations Area Boundary would remain inaccessible to the public during construction and operations and would result in minor long term, and localized impacts. Use-specific impacts are outlined below.

**Hunting**

There could be potential access delays to areas utilized by the hunting community from construction and mine traffic, which would be minor, short-term to long-term, and localized. In addition, approximately 13,452 acres of NFS lands and approximately 775 acres of private patented lands within the Operations Area Boundary would remain inaccessible to hunters during operations, resulting in minor, long term, and localized impacts.

**Fishing**

There is potential for changes in water quality, water temperature, and streamflow to occur in streams within the analysis area, during construction through reclamation, all of which could impact fish and local habitat potential for fish. Fishing access to the streams within the Operations Area Boundary would also be restricted until reclamation is completed. Long term, the reclamation activities should improve the quality of the aquatic habitat and sport fishing compared to the current conditions. There would be no stream flow changes to streams along either the Johnson Creek Route or the Burntlog Route but there is potential for sediment and contaminants from roadway construction, vehicle traffic, and maintenance along these streams. Any reduction in fish populations could affect the success and experience of the recreational fisherman. Impacts to fish and fish habitat are discussed in Section 4.12 and additional detail provided in the Fish Resources and Fish Habitat Specialist Report (Forest Service 2022i). Impacts to recreational fishing would be localized, long term, and minor to moderate.

**Motorcycle and ATV/UTV Use**

Motorcycle and ATV/UTV drivers and riders could potentially encounter access delays and safety-related issues as well as temporary decreases in trail access as a result of construction, operations, and increased mine and vehicular traffic. While a public access road will be open and maintained within the Operations Area Boundary, trails leading to the Stibnite Mining District Interpretive Site would be closed to the public. Impacts are anticipated to be minor, long-term, and localized. Impacts to Special Use Permit ATV/UTV events are described below under Recreation Special Use Permits and in the corresponding sub-section in Section 4.19.2.3 for the Johnson Creek Route Alternative.

**Mountain Biking**

Use of the Johnson Creek Route during construction could result in temporary impacts to bicyclists that use these roads, due to potential delays, increased traffic, and safety-related issues from mine-related traffic. Impacts to biking utilizing the Johnson Creek Route are expected to be minor, temporary, and localized while the Burntlog Route is being constructed. In addition, there could be potential access delays to areas utilized by the mountain biking community from construction and mine traffic, which would be minor, short term to long term, and localized.
Recreational River Users

The SGP would not have any direct impacts on recreational river use. Under the SGP operations and closure, water quality of surface flow departing from the Operations Area Boundary would be the same or better than existing baseline conditions; therefore, there would not be impacts to the quality of downstream waterways (Section 4.9) and the use by recreational river users. There would be no change in potential human health impacts from dermal contact or ingestion of river water downstream. There could be indirect short-term impacts to the recreational setting (i.e., visual changes and noise), most of which would be short-term during construction of the Burntlog Route while mine traffic is utilizing Warm Lake and Johnson Creek roads. These impacts are anticipated to be minor, short term, and localized.

Horseback Riding

There could be potential access delays to areas utilized by the horseback riding community from construction and mine traffic, which would result in minor, short-term to long-term, and localized impacts.

Hiking

There could be potential access delays to trails and trailheads utilized by hikers from construction and mine traffic, which would result in minor, short-term to long-term, and localized. In addition, approximately 13,441 acres of NFS lands and approximately 780 acres of private patented lands within the Operations Area Boundary would remain inaccessible to hikers during operations. Construction of the Burntlog Route may provide additional backcountry hiking access into new areas and an additional road to established trails and trailheads, resulting in minor, long term, and localized impacts.

Winter Use

There would be potential access delays to backcountry skier access points, such as Landmark, due to construction and mine traffic that could affect recreation sites/areas along the surrounding roads such as Warm Lake Road and Johnson Creek Road, as well as sites and areas accessed from these roadways. Ski access from Big Creek Summit has been growing in recent years due to the increasing popularity of skiing in the area. The increase in truck traffic could impact skier safety, some of which includes skiers and OSV riders walking on the road to the summit parking lot. These potential moderate, short-term, and localized impacts to backcountry skier access would last seasonally until the Burntlog Route is constructed. Impacts to OSV recreation are discussed above in Recreation Opportunities, Facilities, Access, and Use for winter use.

Recreation Special Use Permits

Construction and Operations

There are several current recreation-related special use permits in the analysis area (fully described in Appendix A of the Recreation Specialist Report [Forest Service 2022m]). Recreation-related special use permits within the PNF include Big Creek Lodge, Elk Springs Outfitters, Flying Resort Ranches, Idaho Wilderness Company, and Yellowpine Escapades ATV/UTV event. In the BNF, recreation-related special use permits include Juniper Mountain Outfitters, North Shore Lodge, Warm Lake Lodge and Resort, Warm Lake Camp, Youth with a Mission (YWAM), and recreation residences. Impacts to each recreation
There are no 2021 MMP components that would directly impact the Big Creek Lodge during construction; however, some components may affect recreation opportunities, access, and experiences in areas south of the lodge in the analysis area. Impacts to lodge customers would depend on their recreation location away from the lodge but are anticipated to be minor to moderate, short term, and localized.

Construction and operation of the new transmission line to the Operations Area Boundary, road improvements along the Burntlog Route, closure of Stibnite and Thunder Mountain roads through the Operations Area Boundary, communication facilities, and Operations Area Boundary facilities would temporarily affect the ability of Elk Springs Outfitters to access approximately half of their operating area, provide IOGLB licensed activities, and may degrade recreation experiences for customers participating in guided activities near construction of these components due to construction and mine operations noise and activity, construction and mine traffic, new motorized use, and reduction of acreage for available recreation. The portion of the Elk Springs Outfitters operating area north and west of Yellow Pine would be accessible, and free of the 2021 MMP construction activities; therefore, permitted use may be displaced to this area, as well as recreational use from the analysis area. Impacts from construction are anticipated to be minor, temporary to short term, and localized. Beneficial impacts during SGP operations to Elk Springs Outfitters may include increased cellular coverage in their operating area resulting in customer safety improvements. Impacts from operations are anticipated to be minor, long term, and localized.

There are no 2021 MMP components that would impact the Flying Resort Ranches operating area during construction or operations; there are no planned activities in or adjacent to their route through the FCRNRW to Big Creek.

Construction of road improvements along the Burntlog Route, closure of Stibnite and Thunder Mountain roads, and Operations Area Boundary facilities would affect the ability of the Idaho Wilderness Company to access approximately 25 percent of the southern portion of their operating area, provide IOGLB licensed activities, and may degrade recreation experiences for customers participating in guided activities near construction of these components due to construction and operations noise and activity, mine traffic, and reduction of acreage available for recreation. The portion of the Idaho Wilderness Company operating area in the FCRNRW northeast of the SGP would be available for any displaced permitted use; however, access to this portion of the operating area may need to be relocated to be out of Big Creek, rather than Thunder Mountain Road, due to the closures and improvements on this road. Impacts from construction are anticipated to be minor, short-term, and localized. 2021 MMP components that would affect the Idaho Wilderness Company during operations would be the same as those under construction, with the addition of operation of the communications facilities. Beneficial impacts to the Idaho Wilderness Company may include increased cellular coverage in their operations area and resulting customer safety improvements. Impacts from operations are anticipated to be minor, long term, and localized.

Construction and operation of all the 2021 MMP components would affect the Juniper Mountain Outfitters operating area either directly or indirectly, specifically the ability to access approximately 50
percent of their operating area, provide IOGLB licensed activities, and may degrade recreation experiences for customers participating in guided activities near construction of the 2021 MMP components due to construction and mine operations noise, traffic, new motorized use, and reduction of acreage available for recreation. The portion of the Juniper Mountain Outfitters operating area north and south of Warm Lake surrounding the SFSR would be accessible and free of the 2021 MMP construction and facilities operations activities; therefore, permitted use may be displaced to this area, as well as other recreational use from the analysis area. Impacts from construction are anticipated to be moderate, temporary to short-term, and localized. Impacts from operations are anticipated to be minor, long term, and localized.

Construction of transmission line upgrades and summer use of Warm Lake Road would affect traffic, noise, and vehicular access for the North Shore and Warm Lake Lodges, Warm Lake Camp, YWAM, and Warm Lake recreation residence tract and thus could adversely affect the recreation experience for some recreationists as well as the recreation setting due to an increase in traffic and traffic noise. It is not anticipated that transmission line upgrade activities, including work at the Warm Lake substation, would be visible or audible from the lodges or camps or from the Warm Lake recreation residence tract as this area is over 0.5 mile away from the transmission line and substation with intervening vegetation. Impacts from the transmission line upgrades would be minor, temporary, and localized. There would be no winter access changes on Warm Lake Road in the area near the lodges, Warm Lake Camp, or Warm Lake recreation residence tract, and there is no winter use of the YWAM facility and thus changes to winter use and maintenance/plowing of Warm Lake Road west of the facility would not result in winter impacts. There are no 2021 MMP component that would impact the lodges, camps, and Warm Lake recreation residence tract during operations; therefore, no impacts are anticipated from operations activities.

The Cabin Creek OSV route, which would be located near the Paradise Valley recreation residence tract, may result in more winter motorized use north of the lodges, camps, and Warm Lake recreation residence tract. Construction and operation of the transmission line upgrades, summer use of Warm Lake Road, and development and use of the Cabin Creek Road OSV route around the Paradise Valley recreation residence tract would affect traffic, noise, and vehicular access and thus could adversely affect the recreation experience for some recreationists as well as the recreation setting. The upgraded transmission line may be visible from the Paradise Valley recreation residence tract, but there would be some intervening vegetation present. Impacts are anticipated to be minor, temporary to short term, and localized. The new 10.4-mile groomed OSV route along Cabin Creek Road may lead to dispersed winter recreational use along this new route and would be the only available easterly OSV route to Landmark; therefore, there may be more traffic, noise, and recreation use within the area around the Paradise Valley recreation residence tract in the winter, potentially resulting in a change to a more developed recreation setting at the residence tract in the winter. Impacts are anticipated to be minor, long-term, and localized. The parking area for the new Cabin Creek OSV route would be located west of the Paradise Valley recreation residence tract near SFSR Road and would not affect the recreation residence tract.

There are no activities planned that would use SFSR Road; however, additional visitors could be present along this roadway due to displacement of recreational use from the analysis area. Impacts are anticipated to be negligible, long term, and localized.
Closure and Reclamation

There are no 2021 MMP components that would directly impact the Big Creek Lodge during or after closure and reclamation; however, 2021 MMP components may affect recreation opportunities, access, and experiences in areas south of the lodge in the analysis area. Impacts to lodge customers would depend on their recreation location away from the lodge.

2021 MMP components that would affect the Elk Springs Outfitters operating area during closure and reclamation would be similar to those described for construction and operations. The loss of cellular coverage on portions of the analysis area may impact customer safety in the Operations Area Boundary but would aid in returning primitive recreation experiences to the FCRNRW areas in the Elk Springs Outfitters operating area. Providing public access through the Operations Area Boundary after closure and reclamation would restore the ability for Elk Springs Outfitters to reach portions of their operating area without a detour. Displacement of permitted use may continue past reclamation due to permanent changes in the recreation setting within the Operations Area Boundary and potential changes to wildlife present in the area, as some species sensitive to human presence may not return to the area for years after the mine is closed, resulting in a minor, permanent, and localized impact.

The 2021 MMP components that would affect the Idaho Wilderness Company operating area during closure and reclamation would be similar to those described for construction and operations. The loss of cellular coverage on portions of the analysis area may impact customer safety in the SGP but would aid in returning primitive recreation experiences to the FCRNRW areas in the Idaho Wilderness Company operating area. Providing public access through the SGP after closure and reclamation would restore the ability for the Idaho Wilderness Company to reach portions of their operating area without a detour. Displacement of permitted use may continue past reclamation due to permanent changes in the recreation setting within the Operations Area Boundary and potential changes to wildlife present in the area, as some species sensitive to human presence may not return to the area for years after the mine is closed, which would result in a minor, permanent, and localized impact.

Closure and reclamation of all 2021 MMP components would affect the Juniper Mountain Outfitters operating area either directly or indirectly due to recreation displacement from other areas. The ability of Juniper Mountain Outfitters to access their operating area, provide IOGLB licensed activities, and the quality of recreation experiences for customers participating in guided activities near these components may be impacted during closure and reclamation due to noise and reclamation activity. Displacement of permitted use may continue past reclamation due to the changes in the recreation setting in the Operations Area Boundary, and potential changes to wildlife present in the area, as some species sensitive to human presence may not return to the area for years after the mine is closed, which would result in a negligible, permanent, and localized impact.

There are no 2021 MMP components that would impact the North Shore or Warm Lake Lodges, Warm Lake Camp, YWAM, or Warm Lake recreation residence tract during closure and reclamation; therefore, no impacts are anticipated.

Winter use of the Cabin Creek Road OSV route during closure and reclamation would continue to impact the Paradise Valley recreation residence tract as described for construction and operations.
4.19.2.3 Johnson Creek Route Alternative

The Johnson Creek Route Alternative is similar to the 2021 MMP, with the main differences that affect recreation consisting of use of the Johnson Creek Route for access to the mine for all phases (no construction or use of the Burntlog Route); a change in the location of the Landmark Maintenance Facility; and use of helicopters for construction and maintenance of cell towers and repeater sites in IRAs managed for backcountry/restoration. These changes would result in different impacts than the 2021 MMP, particularly the use of the Johnson Creek Route.

Recreation Opportunities, Facilities, Access, and Use

Construction and Operations

Impacts of the Johnson Creek Route Alternative during construction and operations would be the same as those described under the 2021 MMP, except for those described below. The Burntlog Route and Burntlog Maintenance Facility would not be constructed under the Johnson Creek Route Alternative; therefore, there would be no construction impacts related to those facilities.

Year-Round

Use of Johnson Creek and Stibnite roads as the route to the Operations Area Boundary during construction, operations, and reclamation and closure would result in impacts to the recreation setting of the existing recreation sites/areas along these roads due to increased noise, traffic, and safety-related issues from mine-related traffic (Forest Service 2022d, 2022k), leading to a change in recreation experiences for some visitors. Traffic on Johnson Creek and Stibnite roads would substantially increase (almost two times the current traffic conditions, respectively), thereby increasing the noise and activity near campgrounds and trailheads adjacent to these roads. Impacts are anticipated to be moderate, short-term, and localized.

Recreation facilities affected by the increase in traffic and traffic noise would include Burntlog and Quartz Creek Trailheads; Buck Mountain, Trout Creek, Ice Hole, Golden Gate, and Yellow Pine Campgrounds; Twin Bridges dispersed camping area; and Johnson Creek Cabin. The recreation setting of these facilities would be altered to a more developed setting due to an increase in the sights and sounds of humans, which would displace recreationists to avoid noise associated with activities and traffic along Johnson Creek and Stibnite roads, particularly recreationists participating in non-motorized activities. Motorized users who use Johnson Creek and Stibnite roads for recreation also may be displaced due to the increased traffic along the roadways. Wildlife-related recreation opportunities also would decrease along these roadways due to wildlife displacement from traffic and noise. This impact is anticipated to be minor, short term, and localized.

During construction, there would be periodic temporary road closures on Johnson Creek Road that would result in reduced access to recreation sites/areas, reduced recreation opportunities, reduced use due to a lack of access, and impacts to recreation experiences due to visitor expectations regarding site/area availability. Impacts from road closures would affect recreation sites/areas along Johnson Creek Road, as well as sites, trails, and areas accessed from this main route. Impacts would persist throughout construction and are anticipated to be moderate, short term, and localized. There also would be daily
closure of Stibnite Road for most of the middle of the day during mine construction that would result in reduced access to recreation sites/areas off Stibnite Road and Thunder Mountain Road, reduced recreation opportunities and use due to temporary reductions in access, and impacts to recreation experiences due to delays in reaching destinations. Impacts from road closures would affect recreation sites/areas along Stibnite Road, as well as sites, trails, and areas accessed from this main route, particularly sites off Thunder Mountain Road. Depending on where the closure started on Stibnite Road, access to the Big Creek area north of the mine also may be affected. Impacts would persist throughout the mine construction period and are anticipated to be moderate, short term, and localized.

Although Stibnite Road would be open for public access as part of the Johnson Creek Route, the Stibnite Mining District Interpretive Site would not be available for public use, because it would be within the Operations Area Boundary where no public use would be allowed. This impact is anticipated to be moderate, long term, and localized.

The Yellow Pine Escapades are Special Use Permit ATV and UTV events that frequently use Johnson Creek and Stibnite roads in addition to varying Forest Service trails based on the event type. The Yellow Pine Escapades are hosted by the Yellow Pine Community Hall Committee as fundraising events for the community hall maintenance (Yellow Pine Escapades 2022) and may include stops at interpretive sites for educational purposes. Increased traffic on Johnson Creek and Stibnite roads, decreased trail access due to road closures, and the closure of the Stibnite Mining District Interpretive Site are anticipated to have a moderate, long-term, and localized impact on these recreational events.

Impacts during construction and operations would be the same as under the 2021 MMP because Johnson Creek and Stibnite roads would continue to be used as the main access roads into the Operations Area Boundary and would require periodic road maintenance activities. AADT for these roads would be lower during operations than described under construction, but within 15 vehicles, thus resulting in similar impacts described under construction; however, impacts due to temporary closure of Johnson Creek and Stibnite Roads would not occur during operations. Fish adjacent to the Johnson Creek Route may be affected by increased sediment and could be affected if a spill were to occur. While there may be injury or mortality to individual fish, population-level effects are not expected (Section 4.12). There may be decreased fishing success immediately along the Johnson Creek Road, but there would continue to be opportunities for fishing within the creeks in the adjacent areas. Operational impacts from the Johnson Creek Route to fishing recreation would be minor, long term, and localized.

Winter

Impacts during construction and operations from the plowing of Johnson Creek Road would be similar to those described for construction under the 2021 MMP; however, the groomed OSV route along the western side of Johnson Creek Road would run from Trout Creek campground to Landmark (approximately 8 miles) under the Johnson Creek Route Alternative, allowing continued use of the Ditch Creek Road groomed OSV route. The new groomed OSV route along Johnson Creek Road would remain through operations and closure/reclamation under the Johnson Creek Route Alternative as the Johnson Creek Route would be used throughout the life of the SGP. Therefore, impacts from the plowing of Johnson Creek Road under the Johnson Creek Route Alternative are anticipated to be minor, long term, and localized.
Public Access

Road closure impacts on the Johnson Creek route would be the same as those described under the 2021 MMP, except impacts to recreation access, use, and opportunities along Thunder Mountain Road would begin during construction and continue until the public access road through the Operations Area Boundary was complete and open to public use to provide access to the Thunder Mountain area. Construction under the Johnson Creek Route Alternative is expected to take 2 years longer than the 2021 MMP.

The impacts to public access through the Operations Area Boundary would be the same as under the 2021 MMP. The public access road would provide access to recreation sites/areas via Thunder Mountain Road; therefore, the access road would allow continuous access to the Thunder Mountain Road sites/areas. However, as described under the 2021 MMP, there would be temporary closures of this route during some mining activities that would result in minor, short term, and localized impacts to recreation.

Landmark Maintenance Facility

The Landmark Maintenance Facility would be located approximately 0.1 mile south of Landmark and the historic cabins located there. Access to the maintenance facility would be off Warm Lake Road. There would be no delays or additional traffic along Warm Lake Road in this area since the Burntlog Route would not be constructed, but rather from all construction-related traffic using Warm Lake Road to Johnson Creek Road. It is assumed that construction equipment would travel east on Warm Lake Road; therefore, delays would likely affect access to Horn Creek Road, Rec Spur 579U2, 450 South, and Burnt Log Road, which are east of the maintenance facility site. This impact is anticipated to be moderate, short term, and localized.

Noise associated with construction activities could reduce opportunities for noise-sensitive recreation activities at and around the maintenance facility location (up to 1.1 miles away) (AECOM 2019c), including wildlife-related recreation activities, because wildlife may be displaced. Construction activities would not affect use of the historic cabins; however, construction noise at the site may affect the recreation setting of the cabins, because it may be audible from the cabin sites. Some recreationists may choose to visit other areas or sites to avoid delays or noise from construction activities. Any reduction in recreation opportunities, displacement of dispersed recreational use, or changes in access would be temporary until maintenance facility construction was completed. These impacts would be minor, short term, and localized.

Development of the Landmark Maintenance Facility would reduce recreation opportunities due to physical removal of acreage for the facility (3.5 acres). Traffic due to maintenance activities and vehicles would not be expected to result in frequent traffic delays on Warm Lake Road but may result in occasional delays due to road plowing, grading, repairs, etc., and would occur as operational impacts because the facility site would be accessed via the Johnson Creek Route. Traffic and other operational noise from the maintenance facility would generally not be audible from the facility; however, road maintenance activities would result in noise levels above background ambient noise levels of 40 dBA for up to 0.8 to 1 mile from the road (AECOM 2019c). This would likely reduce opportunities for some recreational activities in this area, particularly wildlife-related recreation activities, because wildlife may be displaced from the general maintenance facility area. Operation activity noise from the maintenance
facility would not be heard at the historic cabins at Landmark, although the large buildings and solar panels at the facility may be visible from the historic cabins and from nearby roads. The maintenance facility would increase man-made development in the Landmark area, including nighttime lighting, resulting in a moderate, long-term visual contrast. Such changes may affect the recreation setting of the general Landmark area, including the historic cabins and roads in the area, by decreasing the feeling of remoteness and thus affect the recreation experience for visitors to Landmark. Impacts would generally be limited to the area within visual and audible distance of the maintenance facility, and are anticipated to be minor, long term, and localized.

**Communications Facilities**

Construction of repeater sites and the cell tower in areas outside of IRAs would result in the same impacts as those described under the 2021 MMP. Constructing repeater sites in an IRA managed for backcountry/restoration, noise, and disruption from the use of helicopters for construction may temporarily affect the recreation setting for users within visual and audible distance of the helicopters. Impacts would be localized to the repeater sites in IRAs. Changes in the recreation setting around these repeater sites could lead to a temporary displacement of dispersed recreational use, particularly related to non-motorized activities, wilderness activities, and wildlife-related recreation activities (due to wildlife displacement), which currently typically occur in a quieter, non-motorized setting in these areas compared to existing conditions. Additionally, use of helicopters would eliminate the impacts of new access roads to the repeater sites (e.g., changes in the recreation setting along access route that could lead to displacement of dispersed recreational use, particularly related to non-motorized activities, and wildlife-related recreation activities) as described under the 2021 MMP. The impacts under this alternative are anticipated to be minor, temporary, and localized.

Impacts from operation of the cell tower and repeater sites not in IRAs would be the same as those described under the 2021 MMP.

Noise and disruption from the use of helicopters for maintenance of repeater sites in an IRA managed for backcountry/restoration may temporarily affect the recreation setting for users within visual and audible distance of the helicopters. Impacts are anticipated to be minor, temporary during operations and when maintenance activities are conducted, and localized to the repeater sites in IRAs managed for backcountry/restoration.

New cellular coverage in the analysis area would increase visitor safety on NFS lands; however, additional cellular coverage would detract from primitive recreation experiences. Impacts would begin once the cell tower was constructed and would conclude with decommissioning of the site. This impact is anticipated to be beneficial until decommissioning when it would return to baseline conditions.

**Transmission Line and Associated Facilities**

Impacts from transmission line upgrades and the new segment would be the same as described under the 2021 MMP.
Closure and Reclamation

Recreation impacts of the Johnson Creek Route Alternative during closure and reclamation would be the same as those described under the 2021 MMP, except for those additionally described below. The Burntlog Route and the Burntlog Maintenance Facility would not be constructed under the Johnson Creek Route Alternative; therefore, there would be no closure/reclamation impacts related to these facilities.

Johnson Creek Route

Year-Round

Impacts described under operations for the Johnson Creek Route also would occur during closure/reclamation, because Johnson Creek and Stibnite roads would continue to be used as the main access roads into the mine during closure and reclamation. Impacts due to temporary closure of Johnson Creek and Stibnite roads would not occur during closure/reclamation. Impacts to recreation from use of the road through the Operations Area Boundary following closure/reclamation are anticipated to be minor, long term, and localized.

Winter

Impacts described under operations for the Johnson Creek Route also would occur during closure/reclamation, because Johnson Creek Road would continue to be plowed during closure and reclamation. Following closure/reclamation, Johnson Creek Road would no longer be plowed; therefore, impacts are anticipated to be minor, long term, and localized.

Public Access After Reclamation

Under the Johnson Creek Route Alternative, public access through the Operations Area Boundary after closure/reclamation would be on a reopened Stibnite Road, which would include a permanent road through the backfilled Yellow Pine pit, the same as described under the 2021 MMP; however, under this alternative, Stibnite Road) would not be returned to its pre-mining width, and the nine-foot-high retaining walls and various culverts would remain after mine closure and reclamation. After closure and reclamation, traffic on Stibnite Road would be greatly reduced, which would benefit recreation experiences for visitors to the areas/sites east of the Operations Area Boundary off Thunder Mountain Road and encourage the return of recreational use at these sites/areas that was displaced during mine operations due to increased road traffic and road closures. Retaining the increased width of the road would continue to allow a wider range of vehicles to use this road, potentially increasing access. The alterations to the road, including the large retaining walls, would continue to affect the recreation setting, similar to impacts described under the 2021 MMP. Impacts to recreation access, experiences, and use from public access through the Operations Area Boundary would continue beyond closure/reclamation and are anticipated to be minor, permanent, and localized.

Landmark Maintenance Facility

Impacts from closure and reclamation of the Landmark Maintenance Facility would be similar to those described under the 2021 MMP, but in a different location. Impacts would be minor, temporary, and localized to the area surrounding the maintenance facility and the roads/trails accessed from the Warm Lake Road.
Communications Facilities

Impacts from closure and reclamation of the cell tower and repeater sites not in an IRA would be the same as those described under the 2021 MMP.

Noise and disruption from the use of helicopters for closure and reclamation of repeater sites in an IRA managed for backcountry/restoration may temporarily affect the recreation setting for users within visual and audible distance of the helicopters. Changes in the recreation setting around these repeater and cell tower sites could lead to displacement of dispersed recreational use, particularly related to non-motorized activities, wilderness activities, and wildlife-related recreation activities (due to wildlife displacement), which currently typically occur in a quieter, non-motorized setting in these areas. Impacts would be negligible, temporary and would conclude once the sites were closed and reclaimed and localized to the repeater sites in IRAs.

The loss of cellular coverage on portions of the analysis area may impact visitor safety in the area of analysis. The loss of cellular coverage would aid in returning to the previous baseline primitive recreation experiences to the FCRNRW areas adjacent to the Operations Area Boundary.

Transmission Line and Associated Facilities

Impacts during decommissioning of the transmission line, transmission line road, and road/trail improvements would be the same as those described for the 2021 MMP.

Designated ROS Classes and Physical Setting

Impacts of the Johnson Creek Route Alternative on designated ROS classes and estimated ROS physical settings would be the same as those described under the 2021 MMP, except for those summarized below. The Burntlog Route and the Burntlog Maintenance Facility would not be constructed under the Johnson Creek Route Alternative; therefore, there would be no impacts related to inconsistency with the existing ROS designation or the estimated ROS physical setting for these facilities. Impacts from public access through the SGP would be the same as those described for the 2021 MMP. Graphical representations of the estimated ROS physical settings as well as the acreages of disturbance to estimated ROS physical settings under the Johnson Creek Route Alternative are provided in the Recreation Specialist Report (Forest Service 2022m).

Johnson Creek Route

Summer

The areas surrounding roads that would be used as part of the Johnson Creek Route are currently designated as Roaded Natural; therefore, increased traffic on these roads as part of construction would not result in inconsistencies with the existing ROS designation surrounding the roads and no impacts are anticipated. Impacts would be the same as those described under the 2021 MMP for summer estimated ROS physical settings (Roaded Natural and Rural). Impacts would be similar to those described under the 2021 MMP for winter estimated ROS physical settings; however, plowing of Johnson Creek Road would occur through closure/reclamation and would alter the existing estimated winter ROS physical setting of the area around this road to Rural. Impacts to the estimated ROS physical setting are anticipated to be minor, long-term through closure and reclamation, and localized.
**Winter**

Johnson Creek Road from Wapiti Meadow Ranch to Landmark would be plowed and, and as currently occurs, Stibnite Road from Yellow Pine to the Operations Area Boundary would be plowed. Plowing of Johnson Creek Road and Stibnite Road would occur through closure/reclamation. Therefore, plowing 21 miles of Johnson Creek Road and 10.8 miles of Stibnite Road would not be consistent with the existing winter ROS designation classes for the area surrounding these roads, and would be more consistent with a designation of Roaded Natural. This impact is anticipated to be minor, long term, and localized.

**Closure of Stibnite and Thunder Mountain Roads Through the SGP**

Impacts would be the same as those described under the 2021 MMP. Closure of these roads would not result in inconsistencies with the existing ROS designation class of the area surrounding either road; therefore, no impacts are anticipated.

**Landmark Maintenance Facility**

The Landmark Maintenance Facility would be in an area with a current ROS designation and estimated ROS physical setting as Roaded Natural, which can have limited modifications that are visually subordinate to viewers. Therefore, the maintenance facility in this area would not result in inconsistencies with the existing ROS designation class or the estimated ROS physical setting. No impacts are anticipated.

**Recreation Use and Users**

The potential impact to recreation uses and users would be the same as described for the 2021 MMP, with some exceptions as described below.

**Hunting**

There could be potential access delays to areas utilized by the hunting community which would be focused on the Johnson Creek Route during construction of the upgraded roads and mine traffic throughout operations, closure, and reclamation, which would be minor, short term to long term, and localized. There would be no impacts in the Burntlog Route area as these roadways would not be utilized.

**Fishing**

Potential impacts to fish would be the same as the 2021 MMP but the duration of potential impacts along Johnson Creek and the East Fork SFSR would continue through closure and reclamation.

**Motorcycle and ATV/UTV Use**

Use of the Johnson Creek Route during construction, operations, and closure and reclamation could impact motorcyclists and ATV/UTV drivers and riders by creating potential delays, additional traffic, and safety-related issues from mine traffic. Users may experience decreased trail access due to road closures, resulting in minor to moderate, long term, and localized impacts.
Mountain Biking

Use of the Johnson Creek Route during construction, operations, and closure and reclamation could result in impacts to bicyclists that use these roads, due to potential delays, traffic, and safety-related issues from mine-related traffic. Users may experience decreased trail access due to road closures resulting in minor, long term, and localized impacts.

Recreational River Users

There could be indirect long-term impacts to setting (i.e., visual changes and noise) for the duration of operations, closure, and reclamation from mine traffic utilizing Warm Lake and Johnson Creek roads, which are anticipated to be minor, long term, and localized.

Horseback Riding

There could be potential access delays to areas utilized by the horseback riding community from construction and mine traffic in areas along the Johnson Creek Route, resulting in minor, short-term to long term, and localized impacts.

Hiking

The potential access delays to trails and trailheads utilized by hikers along the Johnson Creek Route would continue through operations, closure, and reclamation, resulting in minor, long-term, and localized impacts.

Winter Use

There would be potential access delays to backcountry skier access points, such as Landmark, due to construction and mine traffic that could affect recreation sites/areas along Warm Lake and Johnson Creek roads, as well as sites and areas accessed from these roadways. These potential impacts would be long-term to backcountry skier access be seasonal but last through operations, closure, and reclamation. Impacts to OSV recreation would be the same as discussed for construction and operations.

Recreation Special Use Permits

Construction and Operations

Impacts from construction and operations of the Johnson Creek Route Alternative on the recreation-related special use permits currently approved in the analysis area would be similar to those described under the 2021 MMP. There also would be no impacts to the Elk Springs Outfitters, Idaho Wilderness Company, and Juniper Mountain Outfitters from the Burntlog Route.

Closure and Reclamation

Impacts from closure and reclamation under the Johnson Creek Road Alternative on the recreation-related special use permits currently approved in the analysis area would be similar to those described under the 2021 MMP, except the Elk Springs Outfitters, Idaho Wilderness Company, and Juniper Mountain Outfitters would be impacted from reclamation activities along the Johnson Creek Route instead of the Burntlog Route.
4.19.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis.

4.19.4 Irreversible and Irretrievable Commitments of Public Resources

4.19.4.1 No Action Alternative

Under the No Action Alternative, no action would be undertaken. Consequently, no change would occur in the status of recreation resources in the analysis area.

4.19.4.2 Action Alternatives

The action alternatives would affect recreation access in the analysis area from construction through closure and reclamation. This change in access would be an irretrievable commitment of the recreation resource because existing access to Stibnite Road and Thunder Mountain Road sites/areas would be re-established, either through the Operations Area Boundary or on a portion of the Burntlog Route through the Operations Area Boundary, and winter OSV access would be re-established after reclamation. The only recreation facility that would be closed until Operations Area Boundary access was reclaimed would be the Stibnite Mining District Interpretive Site, which would represent an irretrievable commitment of this resource.

An irretrievable commitment of resources also would occur from the removal of Operations Area Boundary facility areas from recreational use during construction through closure and reclamation. The creation of motorized access to areas with no existing motorized access under the 2021 MMP would be an irretrievable commitment of resources due to displacement of non-motorized recreation opportunities in these areas. Both irretrievable commitments also would affect the ability of recreation-related special use permittees to provide IOGLB licensed activities, and/or may change recreation experiences for customers.

Changes to the recreation setting during construction, operation, and closure and reclamation, and the resulting potential displacement of recreational use to other locations, would be an irretrievable commitment of resources, particularly for FCRNRW areas where the recreation setting was affected. Changes to the recreation setting at the Operations Area Boundary and Burntlog Route, transmission line upgrade areas, and new transmission line ROW to the Operations Area Boundary under the 2021 MMP would be an irreversible commitment because the transmission line ROW would be a modification to the recreation setting of many areas and existing recreation facilities, and the Operations Area Boundary and Burntlog Route would be large reclaimed areas that would take a long period of time to fully revegetate to the point where the sights and sounds of humans would return to existing levels (if ever). Therefore, the recreation setting of these areas would experience long-term and potentially irreversible alterations.

Wildlife displaced from the affected habitat may relocate throughout the region, changing the availability of game for hunters and predators. The change could increase or decrease hunting success, but any reduction in game availability would represent an irretrievable loss of opportunity. Although wildlife species are expected to return following reclamation, some species sensitive to human presence may not return to the area for years after the mine is closed. If wildlife does not re-populate affected areas, there
would be an irreversible commitment of resources in affected areas due to a reduction in wildlife-related recreation opportunities. Long-term impacts to the recreation setting and wildlife populations may affect the ability of recreation-related special use permittees to provide IOGLB-licensed activities and would affect the recreation experiences of customers.

4.19.5 Short-term Uses versus Long-term Productivity

4.19.5.1 No Action Alternative
Under the No Action Alternative, no action would be undertaken. Consequently, there would be no short-term use that would affect recreation resources, and no effect on long-term productivity.

4.19.5.2 Action Alternatives
Both action alternatives would result in short-term use of the Operations Area Boundary and construction of roads; however, the Operations Area Boundary and new roads would be closed and reclaimed at mine closure, except for the soil nail walls. Short-term use of the Operations Area Boundary and other facility locations on NFS lands would reduce acreage available for non-motorized recreation, and would result in displacement of recreational use, modified recreation access, motorized access to areas not currently accessible by motorized vehicles under the 2021 MMP, and changes in recreation opportunities in several management areas. All these short-term impacts to recreation would affect the ability of recreation-related special use permittees to access their operating areas; provide IOGLB-licensed activities; and would affect the recreation experiences of customers.

Because areas would be open for recreation once reclamation was completed, there would not be impacts to long-term use of the Operations Area Boundary, access roads, and other facility locations for recreation after mine closure, although there would be long-term impacts to the recreation setting and recreation experiences. The exception would be the post-closure water treatment plant operations and new transmission line to the Operations Area Boundary under both action alternatives, which potentially would not be reclaimed for an extended period of time and therefore would result in a long-term use of this area. Although wildlife species are expected to return following reclamation, some species sensitive to human presence may not return to the area for years after the mine is closed. If wildlife does not re-populate the area, there may be long-term impacts to recreation due to a reduction in wildlife-related recreation opportunities.

Because the Johnson Creek Route Alternative would have less new access road development, this alternative would have fewer long-term impacts to the recreation setting and recreation experiences; and less potential for a reduction in wildlife-related opportunities. Long-term impacts to the recreation setting and wildlife populations may affect the ability of recreation-related special use permittees to provide IOGLB-licensed activities and would affect the long-term recreation productivity.

4.20 Scenic Resources

4.20.1 Impact Definitions and Effects Analysis Indicators and Methodology
The analysis of effects to scenic resources includes one issue and the following indicators:
**Issue:** Construction and operation of SGP infrastructure may impact scenic integrity and quality and may result in change of the Forest Plan(s) VQOs.

**Indicators:**

- Visual contrast.
- SGP component visibility.

Scenic resources were analyzed using GIS spatial analyses, scientific literature reviews, visual simulations, and information and analysis documented in reports prepared for the SGP.

Visual contrast and daytime/nighttime SGP visibility are the primary indicators used to evaluate potential impacts to scenic resources that could result from construction, operation, and closure and reclamation of the SGP, including:

- Change in landscape character and scenic quality of the analysis area.
- Change in distance zone.
- Change in nighttime lighting.
- Context of impacts, including that directed by forest plan standards and guidelines.
- Change in scenic integrity.

**Visual Contrast Assessment.** Visual contrast is defined as the degree of visual change that occurs in the characteristic landscape due to the introduction of SGP-related alterations. The assessment for visual contrast was performed by comparing visual elements (form, line, color, and texture) of the existing landscape with the alterations associated with the implementation of the proposed SGP. The visual contrast assessment informs change in landscape character and scenic quality.

**Viewshed Analysis.** A viewshed analysis was completed using a GIS tool to identify locations where SGP components can theoretically be seen and areas where components would be obstructed by topography (Figure 3.20-1). The resulting viewshed represents the geographic area where one or more SGP components would theoretically be seen; however, it does not represent any measure of detectability of the components, nor does it account for vegetation that could screen SGP components from view. Actual visibility of SGP components also would be informed by viewer characteristics, described below.

**Viewer Characteristics and Position.** Viewer characteristics and position can affect the perception of visual contrast and a viewer’s ability to discern objects in the landscape (BLM 2013). Viewer characteristics pertain generally to one’s visual acuity, engagement in the visual landscape, and viewer motion (moving or stationary). Viewer position includes consideration of viewer geometry and distance. Viewer geometry refers to the relative elevation of the viewing location as compared to landscape being viewed. A viewer’s elevation to components of the SGP could range from superior, where the viewer is looking down at SGP component(s); to level views and inferior views, where the viewer is looking up. Distance affects the perception of visual contrast because elements of form, line, color, and texture appear less detailed, as distance from a viewpoint increases. Distance zones were established to reflect visibility thresholds.
**Key Observation Points.** KOPs were established at locations representing sensitive-use areas, such as travel routes, waterbodies, recreation areas (developed and dispersed), and residences. Data sources used to identify KOPs included viewshed analysis results, existing land use plans, recreation data, aerial photography, and Forest Plan VQO data. These data were reviewed in conjunction with the alternatives to represent a comprehensive evaluation of the varied SGP components and their potential impacts to sensitive viewer locations in the analysis area, by alternative. Based on collected data sources, 17 viewpoints were identified (Figure 3.20-1).

**Visualizations.** Simulations (i.e., visualizations) were developed to characterize the anticipated level of visual change for the SGP. Simulations portray images of existing and proposed visual change to aid in visualizing the potential SGP effects for areas of high viewer sensitivity or concern. To generate the simulations, photographs were taken using a digital camera mounted on a tripod with a fixed 50-millimeter (equivalent) lens. At each KOP location, overlapping photographs were taken to allow for electronic conversion to a panoramic image representing the full human field of view. GPS equipment was used to record the date, time, and location of each photographic series. Simulations were created using a scaled computer-generated model of proposed facilities that was developed in Autodesk Civil 3D. GIS information from ESRI ArcMap software was imported into the 3D model. The model was then imported into Autodesk 3ds Max software where color and texture were added to resemble planned materials. The 3D model, the camera, and the lighting information was used to render a two-dimensional image of the proposed facility representing the view from the KOP for which simulations were developed. Simulations are used to evaluate the accuracy of predicted visual effects and are included in Appendix A of the SGP Scenic Resources Specialist Report (Forest Service 2022n).

**VQO Classification Conformance.** The results of the impact analysis were used to help determine SGP conformance with relevant VQO classifications for each action alternative. As described in the Scenic Resources Specialist Report (Forest Service 2022n), VQOs establish minimum acceptable thresholds for landscape alterations from an otherwise natural-appearing forest landscape. The threshold of effects is exceeded when alterations do not meet the visual intensity and dominance criteria of the VQO.

The impacts definitions for intensity, duration, and context (Forest Service 2012c) are provided in Table 4.1-1.

**4.20.2 Direct and Indirect Effects**

Additional details on the direct and indirect effects to scenic resources can be found in the SGP Scenic Resources Specialist Report (Forest Service 2022n).

**4.20.2.1 No Action Alternative**

Under the No Action Alternative, the mining and associated activities for the SGP would not be implemented, and no development of the SGP or supporting facilities would occur or be introduced. The existing environment as described in Section 3.14 would remain as it currently exists. Existing disturbances associated with legacy mining activities at the SGP would still be visible to sensitive use areas, but there would be no changes to the PNF and BNF characteristic landscape. Reclamation activities would not be performed and permanent changes to the landscape in the area of the legacy mine activities would dominate the landscape. However, reclamation associated with authorized exploration under the
Meadow Creek Exploration Project would be conducted (Forest Service 2015c). Existing VQO classifications would remain the same under this alternative; therefore, there would be no direct or indirect effects to scenic resources as a result of the No Action Alternative. The existing disturbances associated with legacy mining activities do not meet the Partial Retention VQO and would continue under the No Action Alternative.

4.20.2.2 2021 MMP

Elements of the 2021 MMP may be inconsistent with current VQOs as designated by the PNF and BNF. More specific detail on acreages associated with these potential inconsistencies are provided in Appendix B of the Scenic Resources Specialist Report (Forest Service 2022n).

Operations Area Boundary

Based on the viewshed analysis, the proposed facilities in the Operations Area Boundary could be visible from two KOPs, where a detailed analysis was performed: KOP 1 and KOP 4. Although the viewshed analysis indicates the SGP also may be visible from KOP 2, a more in-depth review of site-specific photos indicate views of the SGP would be obstructed by intervening topography (Appendix C of the SGP Scenic Resources Specialist Report [Forest Service 2022n]).

Effects to the Characteristic Landscape

Throughout construction of facilities and early mining, excavating pits and reprocessing the historical tailings would expose lighter-colored rock and some unweathered rock that would introduce strong visual contrast with existing rock, soils, and vegetation. Landform modifications associated with initial development during pre-production would result in a low level of visual contrast to the existing landscape, primarily due to legacy mining disturbance and scale of construction activities during this timeframe. New disturbances in the footprint of existing modifications would introduce similar form, line, color, and textures.

As mining moves into undisturbed areas, slope cuts and terraces associated with the open pits would remove vegetation, expose unweathered lighter-colored rock, and create unnatural horizontal lines in the landscape. At night, lighting from the mine facilities, including the communications tower to the east of the SGP, the pits, haul trucks, and traffic on access routes would change the character of the night sky by increasing sky glow or light pollution. Long-term visual contrast would be associated with the expansion of mining activities to full build-out and continued nighttime lighting. However, these impacts would be reduced by implementing lighting design features, including directing lights downward, and shielding where appropriate. Overall, long-term visual contrast introduced to the characteristic landscape would be moderate and localized, primarily due to the expansion of mining activities and introduction of nighttime lighting.

Major landscape alterations under the 2021 MMP would expand on the existing mining landscape modifications through the operation of the Yellow Pine pit, West End pit, Hangar Flats pit, the TSF, and the TSF Buttress. Modifications that currently exist due to legacy mining activity include the introduction of monolithic landforms of an industrial scale that exhibit bold form, strong lines, contrasting color, and vegetation patterns and textures that do not blend into the natural landscape. The 2021 MMP would introduce additional modifications to the landscape similar to those present, which would further reduce
the scenic integrity of the area by introducing additional strong visual contrast and discordant elements. Other 2021 MMP support facilities, including ore-processing, lime-processing, storage areas, worker housing facility, and other administrative offices, also would modify the characteristic setting, but at a smaller scale.

Additionally, air quality modeling predicts visual impacts from the potential emissions plume. Actual visibility would depend on meteorological conditions. Visibility and associated impacts would lessen the greater the distance from the Operations Area Boundary and visual contrast would appear strongest during times of low sun angle. Section 4.3 and the SGP Air Quality Specialist Report provide additional information regarding the emissions plume (Forest Service 2022a).

The TSF Buttress would be located in a steep valley between mountain ridges. The material would be placed on an active working base and expanded upward as the facilities are built out. As a result of storing development rock in a valley surrounded by mountainous terrain, this would appear as wider valley basins, with terracing or sloping evident at the valley edges. As landform modifications proceed for all three open pits, the TSF, and the TSF Buttress, the visual contrast would be strong, and result in a high level of change to the existing characteristic landscape.

The 2021 MMP would be within areas managed as a VQO of Retention or Partial Retention (Figure 3.20-2). Where visible from viewing platforms, the 2021 MMP would not meet either of these VQOs as the components would introduce form, line, color, and texture found infrequently or not at all in the characteristic landscape, and to a degree that would dominate the characteristic landscape. These effects could be visible from the Stibnite Road (CR 50-412) and the Meadow Creek Lookout viewing platforms. Overall, the disturbances associated with the 2021 MMP would introduce strong contrast as a whole; visual impacts of the SGP during construction and operations would be long term, moderate to major, and localized.

After closure and reclamation, permanent visual contrast associated with structures (i.e., buildings, communication facilities, transmission line) would be minimal, because mine support facilities would be dismantled, removed from the site, and the landform would be regraded, and reclaimed with native vegetation. Closure of the 2021 MMP facilities also would eliminate the primary source of nighttime lighting. Once reclamation is completed and mine-related vehicle travel to the Operations Area Boundary has ceased, nighttime lighting would be similar to existing conditions. At closure, major landform modifications at the 2021 MMP, including the Yellow Pine pit backfill, the TSF, TSF Buttress, the Hangar Flat pit backfill, and haul roads, would be contoured and graded to blend into the surrounding topography and terrain. Strong visual contrast would be permanent for a portion of the pits where lighter-colored exposed rock and horizontal benches would remain in unnatural, geometric landforms. These lighter-colored landforms would contrast sharply with adjacent scenery that has been unmodified. The geometric form of the horizontal benches above the backfilled portions of the Yellow Pine and West End pits would still appear unnatural in this setting. The TSF and TSF Buttress would have rounded crests and variably shaped angles to more closely resemble natural landforms, which would help to reduce visual contrast. As mature vegetation establishes on reclaimed TSF and TSF Buttress landforms over time, visual contrast associated with lighter-colored soils would diminish for a large portion of these disturbed areas. Although reclamation and revegetation efforts may reduce color contrast over time, the TSF would
require a substantial buttress to ensure long-term stability, which would introduce strong geometric lines and unnatural form into the landscape permanently.

The reconfiguration of the East Fork SFSR through the reclaimed 2021 MMP would introduce curvilinear (i.e., winding) and more natural-appearing forms to the landscape; however, the modified landforms associated with the 2021 MMP would dominate the setting. The reconfiguration of the East Fork SFSR over time would soften the sharp contrasts in that area as vegetation matures. The Hangar Flats pit would be completely backfilled, resulting in a line and form that would blend with the surrounding natural topography. With successful revegetation of the backfill, it would have a more uniform color with the surrounding undisturbed landscape, with varied colors and textures. The Yellow Pine pit would be backfilled to accommodate reconfiguration of the East Fork SFSR. The West End pit would not be backfilled and would have a pit lake that would introduce dark tones and reflectiveness from the water. Stibnite Road (CR 50-412) would not be reclaimed and a new connector to Thunder Mountain Road (FR 50375) would be constructed over the backfilled Yellow Pine pit. The level of visual contrast associated with the road would be low, similar to existing conditions; and would not contribute substantially to permanent effects. Meandering stream channels would be designed across the TSF and TSF Buttress. Reclamation and revegetation of SGP features would contribute collectively to reduce permanent visual contrast to the characteristic landscape. Permanent visual impacts would be moderate and localized.

Effects by Key Observation Point

KOP 1: Meadow Creek Lookout

A portion of the SGP would be visible from this viewpoint in the middle-ground distance zone, approximately 2.5 miles to the northeast. Short-term impacts visible from KOP 1 would be similar (moderate, localized) to those described above and would be seen from a superior vantage point. Visual impacts from construction would alter the experience for individuals at the lookout by transforming it to a more industrial setting.

Under the 2021 MMP, during operational conditions, the tailings would appear as large, flat, smooth, and uniform at the bottom of the valley, which would result in strong visual contrast against the sloping, uneven texture of the surrounding mountains and valley. The flat top and monolithic form of the TSF would introduce strong contrast against the more complex, rough, rugged surrounding topography. Complete backfill of the Hangar Flats pit would restore a more uniform line with topography. However, until successful revegetation, it would appear as a lighter color than the surrounding undisturbed landscape. From this viewpoint, the TSF full build-out would consume most of the Meadow Creek valley, creating a wider basin between the mountain ranges, which is not typical for this landscape. The TSF would appear to be an artificially smooth, regular, and continuous form, contributing to a strong level of long-term visual contrast. Intervening terrain would obstruct views of the Yellow Pine pit and West End pit. Only the TSF, TSF Buttress, and the recently backfilled Hangar Flats pit would be visually dominant in the middle-ground distance zone. Due to their distance, mine support facilities may be visible but individual components would not be perceptible from KOP 1. The emissions plume would be visible from KOP 1.

Nighttime lighting would be perceptible during construction and operation, although implementation of Forest Service mitigation measures specific to lighting would reduce the magnitude of impacts from sky
 Permanent contrast would be slightly reduced over time because color contrasts of the TSF and the backfilled Hangar Flats pit would gradually diminish through reclamation and revegetation. For areas where revegetation is not possible, in geologic time (i.e., millions of years), weathering would reduce the contrast but, in any human-type context, the change would be permanent because of the coloration and angular nature of the granitic rock against more surficial sedimentary type rocks. Visual impacts from mine operation would alter the experience for individuals at the KOP by transforming it to a more industrial setting. Impacts at KOP 1 would be moderate to major, localized, and long term.

At closure and reclamation, the strong visual contrast created by lines and colors of the SGP would be softened slightly over time as vegetation establishes and becomes more diverse. Overall, with the implementation of reclamation, the permanent level of visual contrast would be reduced to moderate-strong for viewers at this KOP indefinitely. Nighttime lighting would return to existing conditions.

**KOP 4: Stibnite Road (CR 50-412)**

A portion of the SGP would be visible from this viewpoint in the middleground distance zone. Short-term impacts visible from KOP 4 would be similar to those described above and would be seen from a superior vantage point. Visual impacts from construction would alter the experience for individuals at the KOP by transforming the area to a more industrial setting.

During operations, the 2021 MMP is completely obstructed by topography for most of the travel route between the village of Yellow Pine and the Operations Area Boundary, and views of the mine infrastructure in the Operations Area Boundary would be limited to a small portion of the road in the immediate vicinity of KOP 4.

During operations under the 2021 MMP, the Stibnite Road (CR 50-412) would no longer serve as the primary access road for the mine. Traffic past the North Gate would be limited to administrative access as needed. Near the North Gate, the 2021 MMP would be visually dominant to receptors due to the scale of landform modifications visible in the foreground. A portion of the Yellow Pine pit would be visible once it is fully built out, but adjacent terrain and vegetation would screen most of the associated disturbances. Where visible, the geometric formation and sharp color contrasts as a result of the Yellow Pine pit would strongly contrast with surrounding natural topography; however, during and after operations, the pit would be filled with development rock, and reclaimed. Color contrast associated with untreated development rock is anticipated to be strong, and would appear light tan in color, which is more uniform in appearance than the surrounding undisturbed landscape, which is primarily dark green.

Because the Operations Area Boundary would not be visible along most of the Stibnite Road (CR 50-412), overall long-term visual contrast associated with road improvements would be low to moderate and remain subordinate to viewers along this travel route. Although minimized through design features, nighttime lighting would be perceptible to travelers from both the 2021 MMP and mine-related traffic on the road. The impacts visible from KOP 4 would alter the experience of individuals traveling on the road by transforming the surrounding setting to a more industrial-like landscape. The emissions plume would be visible from KOP 4.
The limestone crushing plant could be visible from KOP 4 in the middleground once vegetation present in the foreground is cleared. Mine activity associated with the Yellow Pine pit would be present in the foreground between KOP 4 and the limestone crushing plant; therefore, activities associated with the Yellow Pine pit would dominate the views from KOP 4 so that activity and long-term effects associated with the limestone crushing plant would be subordinate. Impacts at KOP 4 during construction and operations would be long term, moderate, and localized.

At closure, Stibnite Road (CR 50-412) would be fully re-opened to the public and reclaimed close to existing conditions except for the new segment through the reclaimed Yellow Pine pit and SGP. Permanent contrast would be reduced to moderate-strong over time, as color contrasts of the backfilled Yellow Pine pit would gradually diminish through reclamation and revegetation. For areas where revegetation is not possible, in geologic time (i.e., millions of years), weathering would reduce the contrast but, in any human-type context, the change would be permanent because of the coloration and angular nature of the granitic rock against more surficial sedimentary type rocks. Night skies would appear as they did prior to the implementation of the 2021 MMP.

**Access Roads**

The primary features relevant to scenic resources for access road infrastructure related to the 2021 MMP include the Burntlog Route, Riordan Creek Segment (approximately 5.3-mile segment); Public Access via Stibnite Road to Thunder Mountain Road Link (12-foot-wide gravel road to connect Stibnite Road (CR 50-412) to Thunder Mountain Road [FR 50375]); and Soil Nail Walls (approximately 1.5 miles of soil nail walls constructed).

The viewshed analysis (Appendix C of the SGP Scenic Resources Specialist Report [Forest Service 2022n]) indicates that the Burntlog Route would be visible from seven KOPs: KOP 1, 2, 4, 9, 10, 12, and 13. The 2021 MMP components described in the list above would result in very similar visual changes to the characteristic landscape as viewed from KOP 4. These components would not be visible from KOPs 1, 2, 9, 10, 12, and 13; and effects would appear as described below. Visibility would generally extend up to 2 to 3 miles to the east of the Burntlog Route and less than 1 mile to the west. The route also could be visible from a ridgeline about 5 to 7 miles west, although due to distance, visual contrast would be weak. Upon further detailed review, the Burntlog Route would not be visible from KOP 2 because of topographic and vegetation screening; therefore, KOP 2 is not discussed further in this section.

**Effects to the Characteristic Landscape**

Construction activity associated with the Burntlog Route would introduce short term visual contrast. Mine traffic would use existing roads (Warm Lake Road [CR 10-579], Johnson Creek Road [CR 10-413], and Stibnite Road [CR 50-412]) to access the mine year-round until construction of the Burntlog Route and the linkage between Stibnite Road (FR 50412) and Thunder Mountain Road (FR 50375) are complete. Warm Lake Road (CR 10-579) does not require improvements to accommodate mine traffic during construction and would continue to be used throughout operations; therefore, short-term visual impacts associated with those roads would be limited to increased construction traffic and associated dust. It would be plowed year-round rather than seasonally groomed for snow machines.
Johnson Creek Road (CR 10-413) and Stibnite Road (CR 50-412) would require improvements, including ditching, culvert repair, graveling, and winter snow removal, to support the increased road use during construction. No widening or changes to the Johnson Creek Road alignment would occur under the 2021 MMP; although a groomed winter route would be added which would add movement to the winter landscape and additional winter viewer platform in this area. Additional tree clearing may be needed to support temporary winter maintenance activities along these roads until Burntlog Route is open to use. Construction activity on the Riordan Creek segment of the Burntlog Route and the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 502375) link would have the same type of impacts to the landscape. Increased construction traffic, dust, grading, ditching, and vegetation removal would occur. Short-term visual contrast associated with maintenance activities, vegetation removal, and winter plowing would be low because the level of visual change would be similar to existing conditions. Impacts would be short term, localized, and moderate.

During operations, long-term visual effects associated with improvements to Burnt Log Road (FR 447) would occur from Landmark to Trapper Flat, which would require grading and removal of vegetation to accommodate a travel width of 20 feet and total width of up to 26 feet (but less in some locations), including shoulders. Road modifications such as side-ditching, culverts, guardrails, and bridges may be upgraded and added to accommodate the expanded road width and stream crossing considerations. Grading improvements and vegetation removal would result in similar form, line, color, and texture of the existing road and disturbed areas associated with dispersed recreation activities. Similar to the existing portion of Burnt Log Road (FR 447), upgrades required along the portion of Thunder Mountain Road (FR 50375) between the worker housing facility and the mine entrance gate would require upgrades to existing access, including grading, vegetation removal, and upgrade of road structures.

During operation of the mine, the Burntlog Route would be routinely maintained, including grading (as needed), spot graveling, dust control, and snow removal in the winter. Mine operation would create traffic to the SGP from buses, vans, trucks, and personal vehicles throughout mine operations. The presence of mine traffic on this route would introduce movement into the characteristic landscape, which for the new portion of the Burntlog Route is primarily roadless. In addition, the presence of vehicles on the road at night would introduce new lighting into the landscape.

The Riordan Creek segment of Burntlog Route and the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would result in changes to the characteristic landscape similar to the other upgraded section of Burnt Log Road, and appear as flat to sloping, smooth, light-brown linear forms through the landscape; and appear consistent with other existing roads in the area. The presence of vehicles on these routes would introduce movement to the landscape, and also provide access in an area with no current road access.

The Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would provide access to and through the SGP and provide a viewer platform from which the 2021 MMP can be viewed. Viewers traveling along the public access road through the SGP would experience close-up, transient, head-on, and peripheral views of large machinery, movement, exposed soil and rock, and other mine-related equipment and infrastructure that would appear as an industrial landscape within the greater forested setting of the PNF and BNF. Soil nail walls would result in strong visual contrast. A 140-foot-tall road cut
near the SGP would introduce a large, smooth light-colored surface above the road that would sharply contrast with the natural, variable lines and forms of the surrounding landscape.

New segments of the Burntlog Route would introduce approximately 15 miles of new road that would be a viewing platform for areas of the forest, providing views to portions of the forest that are not currently afforded any viewing opportunity by a road or trail. Approximately 2 miles of new road would be situated within the viewshed of the SGP in the middleground distance zone.

New construction associated with the Burntlog Route would cross areas managed as Retention, Partial Retention, and Modification VQOs (Figure 3.20-2). With the exception of the soil nail walls, access roads would generally conform to the Partial Retention and Modification VQO. Although new and upgraded portions of the access roads could introduce strong visual contrast in some areas, it typically would be limited to the immediate foreground as viewed from the road introducing the contrast and would appear subordinate from other viewing platforms. New access roads would not be consistent with the Retention VQO as they would introduce new lines, colors, and textures that would be evident. Impacts would be long term, localized, and moderate to major.

Upon closure and reclamation of the SGP, upgraded portions of Burnt Log Road (FR 447) would be reclaimed to existing conditions, and new portions of the Burntlog Route would be removed from use and reclaimed. Soil nail walls and the 140-foot-tall road cut near the SGP are proposed to remain in place after decommissioning and their appearance would continue to introduce strong visual contrast with the surrounding landscape as described above. Post-mine closure, traffic would likely return to a pre-mining level of use. Permanent visual contrast to the characteristic landscape generally would be minimal to moderate because the road would be returned to its previous width although the flatter grades and smoother curves would be retained. Changes to the landscape from removal of mature vegetation would remain evident for several years after reclamation activities. The remaining soil nail walls would be an exception; these areas would introduce strong visual contrast; however, the geographic extent of these changes would be localized. The Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would be reclaimed, and those areas would appear similar to the reclaimed areas of Burnt Log Road (FR 447). Impacts would be permanent, localized, and minor to moderate.

Effects by Key Observation Point

KOP 1: Meadow Creek Lookout

Short-term, construction-related impacts visible from KOP 1 would be associated with mine traffic construction activities along Burnt Log Road (FR 447), which would include increased movement from construction traffic and associated dust. These impacts would appear subordinate to viewers compared with the SGP.

Portions of Burntlog Route would be visible from KOP 1 when looking south. The light-tan color and straight horizontal line introduced by the new roadway portion of the Burntlog Route would introduce a visual contrast against the darker surrounding colors, undulating ridgelines, and variable textures of the vegetation covered terrain. Construction and operations impacts would be long term, localized, and negligible to minor.
After closure and reclamation, permanent visual contrast would be non-visible to weakly visible as viewed from KOP 1, because the portion of Burntlog Route visible from the KOP would be reclaimed to existing conditions.

**KOP 4: Stibnite Road (CR 50-412)**

Under the 2021 MMP, the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would begin at KOP 4. From KOP 4, construction activity associated with road construction would be visible in the foreground, including construction traffic, equipment, dust, and movement of equipment and construction workers.

From KOP 4, the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would travel north through the SGP and appear as a flat to sloping, smooth, light brown linear form traversing the landscape. Although the linear form and light color would contrast with the natural surroundings, it would appear consistent with other existing roads in the area that are visible from KOP 4. Impacts would be long term, localized, and minor.

**KOP 9: Frank Church-River of No Return Wilderness**

Visibility is primarily screened by existing vegetation and intervening topography. During construction activities, weak short-term visual contrast could be experienced from KOP 9. Construction equipment would be difficult to discern at this distance; however, dust and construction activities along the route may be visible. The impacts experienced from KOP 9 would have little to no impact on the overall user experience of the wilderness.

The increased width of the existing road would increase visual contrast, primarily associated with the expanded width of light-colored ground exposed as a result of the road widening. Visual contrast would appear weak from KOP 9 as the landscape already appears lighter in color than other surrounding areas due to the effects of past fires in the area. The improvements to Burnt Log Road (FR 447) would appear subordinate to the large-scale surrounding landscape that would absorb the visibility of these changes to the landscape. The new roadway would not be visible from KOP 9. Impacts would be long term, localized, and negligible.

After closure and reclamation, permanent visual contrast would be non-visible to weakly visible as viewed from KOP 9 because the portion of improved Burnt Log Road (FR 447) visible from the KOP would be reclaimed to existing conditions. Due to screening from vegetation and intervening topography and location within a previously burned area, changes to the landscape from removal of mature vegetation would likely not be evident.

**KOP 10: Burnt Log Road (FR 447)**

Burnt Log Road would be widened and graded to accommodate SGP traffic under the 2021 MMP. Short-term visual contrast from KOP 10 would result from construction activities associated with improvements along Burnt Log Road (FR 447). Construction traffic, equipment, and staff would be evident from this travel route during pre-production. The resulting level of short-term visual contrast would be moderate for receptors due to unobstructed views of construction activities in the foreground. The impacts visible from
KOP 10 would alter the experience of individuals traveling on the road by transforming the surrounding setting to a more industrial-like landscape.

Access road improvements along the existing portion of Burnt Log Road (FR 447) from Landmark to Trapper Flat would require grading and removal of vegetation to accommodate a total travel width of 20 feet and total width of up to 26 feet (but less in some locations), including shoulders. Removal of vegetation would result in moderate color and line contrasts at the road edges. These contrasts would be less strong for portions of Burnt Log Road (FR 447) that are affected by historical fires. Dead or felled trees would be removed, along with low-lying vegetation, resulting in a low to low-moderate level of visual contrast. Landform changes and color contrast associated with new disturbance, where widening or cut/fill is necessary, would contribute to a moderate level of visual change.

Visual impacts, although likely minor, would occur from the introduction of structural components such as culverts, guardrails, and bridges that may be upgraded or added to accommodate the expanded road width. Improved access would introduce a moderate level of visual change to existing form, line, and color; however, Burnt Log Road improvements would remain visually co-dominant to sensitive viewers on the road. During operation of the mine, Burntlog Route would be routinely maintained, including grading (as needed), spot graveling, dust control, and snow removal in the winter. Mine operations would generate traffic to the mine site from buses, vans, trucks, and personal vehicles throughout mine operations. When traveling on the road at night, these vehicles would introduce new lighting into the landscape. The impacts visible from KOP 10 would alter the experience of individuals traveling on the forest road by transforming the surrounding setting to a more industrial-like landscape. Construction and operations impacts at KOP 10 would be long term, localized, and moderate.

Upon closure and reclamation of the mine site, upgraded portions (except segments abandoned at the beginning of construction, which would have been currently reclaimed with construction activities) of Burnt Log Road (FR 447) would be reclaimed to existing conditions. At mine closure, traffic would likely return to a pre-mining level of use. Permanent visual contrast at KOP 10 would be minimal to low-moderate, because the road would be returned to existing conditions with an assumed low-traffic volume. Changes to the landscape from removal of mature vegetation would remain evident for several years after reclamation activities.

**KOP 12: Mud Lake Dispersed Camping Area**

Short-term visual contrast from this viewpoint would result from construction activities associated with improvements along Burnt Log Road (FR 447) within 100 feet of this site. Construction traffic, equipment, and staff would be evident from this area. The resulting level of short-term visual contrast would be moderate and localized for receptors due to views of construction activities in the foreground. The presence of heavy machinery and construction workers, and associated movement, would change the mostly natural setting viewed from KOP 12 to a more industrial-type setting, which would change the experience for viewers using the Mud Lake Dispersed Camping Area at KOP 12; campers would likely not use the site during construction due to visual and noise disruptions.

Access road improvements along Burnt Log Road (FR 447) near Mud Lake would require grading and removal of vegetation to accommodate a total road width of up to 26 feet, including shoulders. Grading
improvements and vegetation removal would result in similar form, line, color, and texture as the existing road. Landform changes and color contrast associated with new disturbance, where widening or cut/fill is necessary, would contribute to a minor to moderate level of visual change, because the site is relatively flat. Noticeable contrast would result from vegetation removal along the road. At this location, vegetation is densely wooded with thick understory vegetation. Removal would result in moderate color and line contrasts at the road edges.

Structural components such as culverts or guardrails may be upgraded or added to accommodate the expanded road width. Improved access would introduce a moderate level of visual contrast to existing form, line, and color; however, Burnt Log Road (FR 447) improvements would remain visually co-dominant to sensitive viewers at this dispersed camping area. During operation of the mine, Burntlog Route would be routinely maintained, including grading (as needed), spot graveling, dust control, and snow removal in the winter. Mine operation would create traffic to the mine site from buses, vans, trucks, and personal vehicles throughout mine operations. The presence of vehicles on this road at night would introduce new lighting into an area that has no permanent lighting sources. These impacts could result in some campers choosing to camp in other dispersed camping areas that have not been visually impacted, particularly night sky impacts.

Upon closure and reclamation of the mine site, upgraded portions of Burnt Log Road (FR 447) would be reclaimed to existing conditions (except segments abandoned at the beginning of construction, which would have been currently reclaimed with construction activities). At mine closure, traffic would likely return to a pre-mining level of use. Permanent visual contrast to the characteristic landscape would be minor to moderate because the road would be returned to existing conditions with an assumed low-traffic volume. Upon closure and reclamation of the mine site, upgraded portions of Burnt Log Road (FR 447) would eventually be reclaimed similar to existing conditions; although removal of mature vegetation would remain visually noticeable for many years after closure and reclamation activities are complete.

**KOP 13: Warm Lake Road (CR 10-579)**

Short-term visual contrast perceptible to travelers on Warm Lake Road (CR 10-579) would result from construction of the Burntlog Route. Construction traffic, equipment, and staff would be evident from this travel route during construction. The resulting level of short-term visual contrast would be moderate and localized for receptors due to views of construction activities in the foreground. The impacts visible from KOP 13 would alter the experience of individuals traveling on the road by transforming the surrounding setting to a more industrial-like landscape.

Access road maintenance and use along the existing Burnt Log Road (FR 447) near KOP 13 would be similar to those described above for KOP 12; therefore, visual impacts also would be similar. However, visual contrast introduced by improvements to Burnt Log Road (FR 447) would be weak as viewed from KOP 13 and associated visual changes would appear subordinate in the landscape. The impacts visible from KOP 13 would alter the experience of individuals traveling on the road by transforming the surrounding setting to a more industrial-like landscape.
After closure and reclamation, due to limited visibility of Burnt Log Road (FR 447) from Warm Lake Road (CR 10-579), visual changes from access road improvements would not be evident from KOP 13 after mine closure and reclamation.

**Utilities**

The viewshed analysis (Appendix C of the Scenic Resources Specialist Report [Forest Service 2022n]) indicates that utilities would be visible from 12 KOPs, where detailed analyses were performed: KOP 1, 2, 3, 5, 6, 7, 8, 9, 14, 15, 16, and 17 (Figure 3.20-1). Visibility is generally limited to a couple of miles on either side of the transmission line but does extend to some ridgelines 5 miles or more to the west. Potential visibility of the transmission line in the valley extends to about 5 miles on either side, although visual contrast would be weak due to distance and less vegetation removal required in these areas. Communications towers are not expected to be visible from the KOPs.

**Effects to the Characteristic Landscape**

Visual impacts associated with short-term activities include increased contrast during construction of the transmission line. Construction vehicles, equipment, and staff would be present along this corridor, which would be visible to viewers in the foreground. Short-term visual contrast during construction would be minor to moderate because these activities would occur intermittently along the ROW over a short duration of time. Construction-related changes to the landscape would not be visible from the Thunder Mountain Estates subdivision.

Upgrading the transmission line to a 138-kV facility would require widening the existing ROW from 70 feet to a total width of 100 feet. The new upgraded structures would be approximately 30 feet taller, with an estimated maximum height of 80 feet and spans ranging between approximately 300 to 600 feet, depending on the type of structure. Long-term visual contrast would primarily result from line and color where the expanded ROW would require additional vegetation removal. Visual changes associated with widening the ROW would reinforce the existing linear form of the ROW edge, resulting in a bolder, geometric, man-made element in this rugged natural landscape. Residents of the Thunder Mountain Estates subdivision would not have foreground views of the upgraded transmission line. The level of visual change would be moderate to high where tree clearing would occur in densely wooded areas with steep terrain due to grading or exposing lighter-colored rock. The taller replacement structures would result in minor to moderate structural contrast for the existing transmission line, and moderate when introducing new structures into an existing ROW. Access for construction and maintenance of the transmission line would occur in the existing ROW, including conductor-stringing vehicles, construction trucks, and equipment. Long-term visual contrast would range from minor to moderate when replacing existing structures in less steep terrain with minimal vegetation removal, to moderate to major where a new transmission line would be introduced in steep terrain with dense vegetation.

The new 8.5-mile-long 138-kV transmission line segment and associated 100-foot-wide ROW would introduce a light-colored line clear of vegetation across the landscape. This linear feature would contrast with the surrounding rugged landscape composed of irregular lines and vegetated, mounded, and triangular landforms carpeted with dark colored mature evergreens and lighter understory. The consistent form, line, and color of the ROW would introduce strong long-term contrast with the variable natural
surrounding landscape. Impacts associated with the new segment would be long term, localized, and moderate to major.

Substation facilities that would be upgraded or introduced into the characteristic landscape would result in long-term, localized visual contrast. For most substations, upgrades would require grading or improvement of land, and clearing vegetation. A new switching station in Cascade would be required on flat terrain occupied by low-lying vegetation, including grasses and shrubs. The level of visual change at this site would primarily be associated with the structural features of the facility, as well as a small area of grading and vegetation removal. Grading activities and vegetation removal would create minimal color and form contrasts with the existing landscape. The visual contrast introduced by the switching station would not be visible from the Thunder Mountain Estates subdivision. Long-term visual contrast to the characteristic landscape in Cascade would be localized and minor to moderate, primarily due to structural contrast.

A new substation, the Scott Valley substation, would be required to support the SGLF in Scott Valley, which is characterized by flat to slightly rolling terrain and low-lying vegetation. The Warm Lake substation would require an upgrade of switchgear facilities, but no additional ground disturbance or vegetation clearing would occur at this site. The existing location has already been modified by local access roads, vegetation clearing, or thinning near the facility; therefore, long-term visual contrast would be negligible due to additional structural contrasts associated with the upgrade. A new Thunderbolt Drop along Cabin Creek Road (FR 447) also would be necessary and would be built under the transmission line and stay within the line ROW FR 447 currently serves as the access road for the existing transmission line corridor and has been modified by vegetation removal and grading at pole locations. Additional grading and vegetation clearing would likely occur, resulting in minor to moderate, localized, long term visual contrast where lighter colored rocks and soil may be exposed, and dense vegetation removed. A new substation (Johnson Creek) would be required along Johnson Creek Road (CR 10-413) near the new transmission line corridor that heads east to the SGP. Similar to FR 447, the terrain is rough, and occupied by dense vegetation. Grading and vegetation clearing would result in moderate visual contrast. The introduction of structures in this landscape setting would result in localized, moderate, and long-term visual contrast due to existing modifications associated with the transmission line corridor.

A new transmission line would cross areas managed as Retention and Partial Retention and upgraded transmission lines would cross areas managed as Preservation, Retention, and Partial Retention (Figure 3.20-2). Generally, new transmission lines would not meet the Preservation, Retention, or Partial Retention VQO but would meet the Modification VQO. The line, color, form, and texture of the ROW would visually dominate the landscape but would not be out of scale with the natural surroundings. These effects would be visible from the following viewer platforms in the foreground and middleground distance zones: Johnson Creek Road (CR 10-413), Burntlog Route (new segment), and the Meadow Creek Lookout.

The upgraded transmission line would remain in service after mine closure along with several of the new and/or upgraded substations. Therefore, long-term effects described above would remain until IPCo completely decommissions the line and associated substations. The new transmission line segment would eventually be decommissioned, removed, and the ROW reclaimed. However, it would take years for the ROW to revegetate with trees. Impacts would lessen over time and eventually become negligible.
Effects by Key Observation Point

**KOP 1: Meadow Creek Lookout**

The new transmission line would be built approximately 2 miles north of KOP 1. Short-term effects to the landscape associated with the new transmission line, such as vehicle movement and dust, would not be evident to viewers from KOP 1.

The cleared ROW for the new transmission line would appear as a light-colored, thin band following the ridgeline. The light-colored line would create a strong level of contrast against the rugged, vegetation-covered hillside. Although visually evident, it would appear subordinate to the TSF that would dominate the landscape in the valley floor. The proposed communication tower located at the mine site also would be visible from this location.

**KOP 2: Frank Church-River of No Return Wilderness – Summit Trail (NFST 088)**

The new transmission line would be built approximately 5 miles north of KOP 2. Visibility would be limited due to distance and intervening topography. Distinct shapes and features are difficult to distinguish at distances of 5 miles and the scale of the landscape also would absorb modifications introduced by the construction of the transmission line. Short-term effects to the landscape associated with the new transmission line, such as vehicle movement and dust, would not be evident to viewers from KOP 2.

Long-term visual effects from the linear, light-colored cleared ROW and transmission structures associated with the new transmission line would not be evident from KOP 2 and would not affect user experience of Summit Trail (NFST 088) in the FCRNRW. The viewshed indicates that the upgraded communication tower located at the mine site would be visible from this location; however, due to distance it would likely not be visually evident.

**KOP 3: Frank Church-River of No Return Wilderness – Mule Hill Trail (NFST 219)**

The new transmission line would be built approximately 5 miles northwest of KOP 3. Visibility would be limited due to distance and intervening topography. Distinct shapes and features would be difficult to distinguish at distances of 5 miles and the scale of the landscape also would absorb landscape modifications introduced by the construction and operation of the transmission line and associated ROW. Short-term effects to the landscape associated with the new transmission line, such as vehicle movement and dust, would not be evident to viewers from KOP 3.

Long-term visual effects from the linear, light-colored ROW and transmission towers associated with the new transmission line would not be evident from KOP 3 and would not affect user experience of Mule Hill Trail (NFST 219) in the FCRNRW. The viewshed indicates that the upgraded communication tower located at the mine site would be visible from this location; however, due to distance it would likely not be visually evident.
**KOP 5: Hennessey Meadow Trailhead**

A new transmission line corridor would parallel FR 416W (Horse Heaven Road) and NFST 233 to the SGP. Construction vehicles, equipment, and staff associated with construction of the new transmission line would be visible to trailhead viewers in the foreground. Short-term visual contrast during construction would be minor to moderate because these activities would occur intermittently along the ROW over a short duration. However, while they are occurring, these activities would disrupt the natural setting of the landscape, making it appear and feel more industrial due to construction equipment and activity in the foreground.

The results of the viewshed analysis show that due to surrounding terrain, visibility of the new transmission line route would be limited locally. The characteristic landscape is highly constrained by steep mountainous terrain that creates an enclosed setting in which long-term visual contrast would be visible. Long-term contrast would primarily result from line and color changes where expansion of the ROW required vegetation removal. Vegetation in the existing ROW would be removed, as well as additional vegetation as required would be cleared to a total width of 100 feet. Grading would be necessary at structure locations, as well as the ROW access road. Moderate to major structure contrast would result from strong vertical lines, dark brown colors, and smooth texture of new transmission line structures. New structural contrast, landform grading, and vegetation removal would result in moderate to major visual contrast due to steep terrain and dense vegetation. Visual changes associated with widening the ROW would reinforce the existing linear form of the ROW edge, resulting in a bolder, geometric, man-made element in this rugged natural landscape. Resulting localized, long-term visual contrast would be moderate to major, which would be minimally screened, and viewed in the immediate foreground. The transmission line and associated ROW would affect the naturalness of the landscape at the trailhead; however, because it would primarily only be visible locally at the trailhead, it is not expected to have a major effect to users’ experience of the trail.

**KOP 6: Twin Bridges Dispersed Camping Area**

Short-term visual contrast from this viewpoint would result from construction activities for the transmission line upgrade. Construction traffic, equipment, and staff would be evident from this site during construction, resulting in short-term minor to moderate visual contrast due to unobstructed views of construction activities in the foreground as viewed from KOP 6. It is likely that construction activities would discourage use of the camping area at least in the short term.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures. The results of the viewshed analysis show that due to surrounding terrain, visibility of the new transmission line route would be limited locally.

Expansion of the transmission line ROW at this location would be highly constrained due to the proximity of the dispersed camping area to Johnson Creek and Johnson Creek Road (CR 10-413). The widened ROW would appear co-dominant for viewers at this moderate-sensitivity dispersed camping area due to scale dominance. Similar form and line would be replicated along the existing transmission line corridor, resulting in a moderate level of visual change that would be evident to viewers in the foreground. Terrain in this area is relatively flat; therefore, landform changes associated with grading and
creating improved access at the campsite would result in a moderate, localized level of visual contrast. Visual contrast would primarily result from removal of tall vegetation; and for viewers at the camping area, may completely eliminate existing trees that partially screen the existing transmission line. Overall, the long-term level of visual change would be moderate as a result of the wider corridor and would affect user experience at the dispersed camping area.

**KOP 7: Idaho Centennial Trail at Johnson Creek Road (CR 10-413) and Burntlog Creek Trail (NFST 075)**

Visual contrast at KOP 7 associated with short-term activities includes construction of the transmission line. Construction vehicles, equipment, and staff would be present along this corridor, which would be visible to viewers in the foreground. Short-term visual contrast during construction would be minor to moderate because these activities would occur intermittently over a short duration. The presence of heavy machinery and construction workers, and associated movement, would change the rural setting viewed from KOP 7 to a more industrial-type setting, which would change the experience for viewers using the ICT at KOP 7.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures. Expansion of the transmission line ROW at this location would cross very steep terrain above Johnson Creek Road (CR 10-413) at the junction of NFST 075 (ICT). The widened ROW would appear co-dominant for viewers due to scale dominance. Similar form and line would be replicated along the existing transmission line corridor, resulting in a moderate level of visual change that would be evident to viewers in the foreground. Visual contrast would primarily result from landform grading at the structure pad sites, additional removal of tall vegetation, and introduction of larger structures. The widened corridor ROW would enhance the existing linear form of the ROW edge, resulting in a bolder, geometric, man-made element in this rugged natural landscape. Long-term contrast would be moderate for recreational users due to unobstructed inferior (viewed from below) views in the foreground. Despite these visual changes, user experience would be similar to existing conditions, because a transmission line is currently visible from KOP 7. A simulation from this KOP is provided in Appendix A of the Scenic Resources Specialist Report (Forest Service 2022n).

**KOP 8: Trout Creek Campground**

Short-term visual contrast from this viewpoint would result from construction activities for the transmission line upgrade. Construction traffic, equipment, and staff would be evident from this site, resulting in short-term minor to -moderate visual contrast due to unobstructed views of construction activities in the foreground, as viewed from KOP 8. While construction activities are occurring, they would disrupt the natural setting of the landscape at the campground, appearing industrial due to construction equipment and activity in the foreground. It is likely that construction activities would discourage use of the campground at least in the short term.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures. The widened ROW would appear co-dominant for viewers at this high-sensitivity campground due to scale dominance. Similar form and line would be replicated along the existing transmission line corridor, resulting in a moderate, localized level of visual change that would be
evident to viewers in the foreground. Terrain in this area is moderate to steep, and upgrades along the ROW may include changes to landform due to grading and exposure of lighter-colored rock. The potential expansion of the ROW at this location could partially or completely eliminate existing trees that screen the current transmission line for sensitive viewers. The widened ROW would enhance the existing linear form of the ROW edge, resulting in a bolder, geometric, man-made element in this rugged natural landscape. Overall, the level of visual change would be moderate due to form and line created by the wider corridor. ROW clearing would remove vegetation screening, resulting in moderate long-term visual contrast to campground viewers in the immediate foreground. These long-term changes would affect user experience at the campground and may deter some recreationists from using it.

**KOP 9: Frank Church-River of No Return Wilderness – Pistol Lake**

Viewshed modeling indicates that short-term visual contrast from this viewpoint could result from construction activities for the transmission line upgrade. However, due to distance and intervening terrain, visual contrast would be weak to none. Existing vegetation also would limit visibility as long as it is present.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures. The widened ROW and new transmission structures would appear subordinate in the background due to distance as well as partial screening from intervening topography and vegetation. User experience would be similar to existing conditions since visual change would be low. Impacts would be localized, long term, and negligible.

**KOP 14: Cabin Creek Road (FR 467)**

Short-term visual contrast from this viewpoint would result from construction activities for the transmission line upgrade. Construction traffic, equipment, and staff would be evident from this site during construction, resulting in short-term minor to moderate visual contrast due to unobstructed views of construction activities in the foreground, as viewed from KOP 14. Based on the results of the viewshed analysis, visibility of the transmission line corridor along FR 467 would be localized due to steep terrain. While construction activities are occurring, they would disrupt the natural setting of the landscape by adding movement, dust, and construction equipment to the views.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures. The widened ROW would appear co-dominant for viewers along this travel route due to scale dominance. Similar form and line would be replicated along the existing transmission line corridor, although color contrast may be more evident where rocky outcrops are disturbed, introducing lighter colors. Recreational users would have immediate foreground views of the upgraded transmission line with minimal screening. Removal of existing vegetation and additional clearing along the ROW edge would introduce a moderate level of contrast with existing vegetation. In addition, grading would be necessary at new structure locations and where access improvements are needed for construction and operation equipment. The widened ROW would enhance the existing linear form of the ROW edge, resulting in a bolder, geometric, man-made element in this rugged natural landscape. Structural contrast would be reduced by adjacent terrain, which would backdrop the structures for viewers traveling along this road while parallel to the transmission line. These conditions would result in an
overall long-term moderate level of visual contrast that would be visible to travel route viewers in the foreground. Despite these visual changes, user experience would be similar to existing conditions, because transmission lines already exist and are visible from KOP 14.

**KOP 15: South Fork Salmon River Road (FR 474) and Warm Lake Road (CR 10-579)**

Short-term visual contrast would include construction activities at the Warm Lake substation and upgrades to the transmission line, including construction vehicles, equipment, and staff. These activities would result in short-term, localized, minor to moderate visual contrast due to unobstructed views of construction activities in the foreground, as viewed from KOP 15. While construction activities are occurring, they would add movement, dust, and additional equipment to the views from SFSR Road (FR 474), which would make the setting appear more industrial compared to the existing rural setting.

Long-term visual contrast would result from landform modifications such as grading and vegetation clearing. The substation upgrade at this site would require no landform modifications or vegetation removal to accommodate additional equipment. Views of the substation would be unobstructed in the foreground. The substation would introduce new structures similar in form, line, and color to the existing transmission line and switchgear but would be larger in size. Facilities would be primarily geometric in form and complex and introduce colors that are more industrial in appearance. These facilities would contrast with the surrounding landscape, which is primarily rural; however, industrial modifications are evident, resulting in a minor to moderate level of structural contrast. Contrast would be minimized by implementing design features that mimic characteristics of the existing landscape, such as the color palette. The site would be large enough to accommodate maintenance vehicles, and these may be visible to sensitive viewers during operation. The perimeter of the substation would be fenced, and nighttime lighting would be required for maintenance activities, introducing sky glow that would impact the integrity of the night sky. Impacts to night sky would be reduced by implementation of design features such as using minimal lighting, directing lights downward, and shielding lights where appropriate.

**KOP 16: Stibnite Gold Logistics Facility**

Short-term visual contrast would include construction of the transmission line upgrade (and logistics facility described below), including construction vehicles, equipment, and staff. These activities would result in short-term, localized, minor to moderate visual contrast due to unobstructed views of construction activities in the foreground, as viewed from KOP 16.

Long-term visual contrast would result from ROW grading, vegetation removal, and introduction of new transmission line structures and a substation. The widened ROW would appear co-dominant for viewers along Warm Lake Road due to scale dominance. Removal of existing vegetation and additional clearing along the transmission line ROW edge would introduce a moderate level of contrast with existing vegetation. Visual contrast from the building would be minimized by implementing mitigation measures requiring design features that mimic characteristics of the existing landscape, as the color palette. The new SGLF would result in greater changes to the characteristic landscape; therefore, the changes introduced by the upgraded transmission line and new substation would appear less noticeable to viewers.
**KOP 17: Lake Cascade Residence**

Short-term visual contrast from KOP 17 would result from construction activities for the transmission line upgrade. Construction traffic, equipment, and staff would be evident from this site, resulting in short-term, localized, minor to moderate visual contrast due to unobstructed views of construction activities in the foreground, as viewed from KOP 17. Residents would experience these changes to the landscape as they come and go from their homes.

Expansion of the transmission line ROW at this location would be highly constrained due to the proximity of the residences to the existing structures. Terrain in this area is very flat; therefore, landform changes associated with grading and creating improved access along the ROW would result in a low level of visual contrast. Visual contrast would result from removal of some vegetation; and for residential viewers, may completely eliminate existing trees that currently screen transmission line structures. Vegetation is less dense at the bottom of flat valleys, which is characteristic of the Cascade area. Vegetation clearing along the expanded ROW would not result in strong line or form contrasts, as seen in densely wooded areas. The introduction of taller structures would increase structural contrast; however, the footprint location may change to accommodate a wider span. Visibility of the facility to residences would depend on the locations of the new transmission line structures. However, residents would likely see the transmission line as they come and go from their homes. Based on the simulation from KOP 17, (Appendix A of the Scenic Resources Specialist Report [Forest Service 2022n]), impacts would be long term, localized, and negligible to minor.

**Off-Site Facilities**

Under the 2021 MMP, off-site facilities would include the Burntlog Maintenance Facility and the SGLF. The maintenance facility would be located along Burnt Log Road (FR 447), 4.4 miles east of the junction of the Johnson Creek Road (CR 10-413) and Warm Lake Road (CR 10-579) along the proposed Burntlog Route. Although the viewshed indicates the proposed maintenance facility would be visible from KOP 12, a closer look at site photographs from KOP 12A indicates that existing vegetation would entirely screen the proposed Burntlog Maintenance Facility from view. Appendix C of the Scenic Resources Specialist Report (Forest Service 2022n) shows the viewshed of the off-site facilities under the 2021 MMP includes site specific photographs from KOP 12.

**Effects to the Characteristic Landscape**

Short-term visual contrast perceptible to travelers on Burnt Log Road (FR 447) would result from construction of the Burntlog Maintenance Facility, including grading, new buildings, and other facilities. Construction traffic, equipment, and staff would be evident from this travel route, resulting in localized, moderate, short-term visual contrast perceived by receptors due to views of construction activities associated with the maintenance facility.

The Burntlog Maintenance Facility would result in minor to moderate visual contrast where grading, vegetation removal, and construction of facilities would occur. Contrast would be minor to moderate, because the facility would be at a borrow source location, so disturbances from road construction would already be present. Grading and vegetation removal would be minimal (previous disturbance associated with existing borrow area), and consistent with the changes to the landscape that occurred as a result of
Burntlog Route construction. The night sky would be impacted by lighting associated with the maintenance facility, which would contribute to sky glow.

The Burntlog Maintenance Facility would be located in an area managed as Partial Retention (Figure 3.20-2). It would meet the Partial Retention VQO as buildings would be constructed using materials and colors that appear in the characteristic landscape. Additionally, due to surrounding vegetation, these facilities would typically not be visible past the foreground distance zone. The SGLF is not within the PNF or BNF, and, therefore, there is no VQO associated with the facility. After reclamation activities have concluded at the SGP, the maintenance facility would be decommissioned and reclaimed to existing conditions. Over time, color contrast would be reduced to a low level of visual contrast once native vegetation becomes established. Permanent visual contrast would be low, and nighttime lighting would return to existing conditions, resulting in negligible permanent visual contrast.

Effects by Key Observation Point

**KOP 16: Stibnite Gold Logistics Facility**

The SGLF in Scott Valley would be constructed on an area of private land that is primarily undisturbed in a landscape with minimal structures. The 25-acre site footprint would extend along Warm Lake Road (CR 10-579) in flat to slightly rolling terrain with low-lying vegetation. Short-term visual contrast perceptible to travelers on Warm Lake Road (CR 10-579) would result from construction of the facility, including grading and introduction of buildings and other facilities. Construction traffic, equipment, and staff would be evident from this travel route. The resulting level of short-term, localized visual contrast would be moderate for receptors due to views of construction activities in the foreground.

Long-term visual contrast would primarily result from size and scale of the structural facilities at this site. Slight modifications to landform may be evident, and vegetation would be cleared in the majority of the site footprint. A 199-foot communications tower would be constructed at or near the facility to provide telephone, internet, and radio communications. It would introduce strong visual contrast due to its tall, vertical, linear form and smooth texture. However, impacts would be limited to within approximately 1 mile as surrounding topography would block it from view any distance farther than 1 mile.

These structural contrasts would introduce a localized, long-term, moderate to major level of visual change that would appear dominant to viewers on Warm Lake Road. Trucks, buses, and cars related to operations at this facility also would be evident to Warm Lake Road viewers, which would contribute to the dominance of this facility. Views of the facility would be viewed in the immediate foreground for high-sensitivity travel route viewers on Warm Lake Road. Additional nighttime lighting would be introduced at this facility, which would contribute to sky glow in an area where existing nighttime lighting is minimal; limited to the few residences in Scott Valley.

After closure of the mine, the SGLF would not be reclaimed and it would be made available for other light industrial uses. Permanent visual contrast would be high, and nighttime lighting would likely remain, resulting in permanent visual impacts.
4.20.2.3 Johnson Creek Route Alternative

Only impacts that differ from the 2021 MMP are discussed below. The viewshed and simulations of the Johnson Creek Route Alternative are provided in Appendix A of the SGP Scenic Resources Specialist Report (Forest Service 2022n).

Operations Area Boundary

Effects to the Characteristic Landscape and KOPs would be the same as those described under the 2021 MMP.

Access Roads

Under the Johnson Creek Route Alternative, the Burntlog Route would not be used for mine access; therefore, no road upgrades or new road segments would be constructed for that route. Therefore, the visual impacts associated with Burntlog Route would not occur under the Johnson Creek Route Alternative. However, visual impacts would occur as a result of the upgrades to, and year-round mine use of, the Johnson Creek Route.

A new road linking Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375), providing public access through the SGP, would occur under the Johnson Creek Route Alternative. The visual impacts would be the same as those described for the 2021 MMP (Section 4.20.2.2).

Effects to the Characteristic Landscape

Short-term visual effects associated with construction activities under the Johnson Creek Route Alternative would occur as a result of upgrades to the Johnson Creek Route. Major road widening and/or straightening of curves, with associated cut and fill, would be required for the Johnson Creek Road (CR 10-413) portion of the Johnson Creek Route. Construction of retaining walls and culverts would require vegetation removal and would expose large areas of native soil and rock that would visually contrast with surrounding vegetation and the rugged, varied topography. Further, traffic along the road from construction vehicles and equipment for widening the Stibnite Road portion of the route would introduce additional movement and dust from vehicle traffic along Johnson Creek Road compared to existing conditions. Because reconstruction of both roads would need to be completed prior to facilities construction at the SGP, construction activities and related traffic would extend to 5 years. Visual impacts from construction activities and related traffic would be long term, localized, and moderate to major.

Short-term impacts associated with the road linking Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) would be similar to those described for the 2021 MMP (Section 4.20.2.2). The Stibnite Road portion of the route would be improved by widening curves to accommodate 55-foot semi-truck trailers. Construction of retaining walls and culverts would require vegetation removal and would expose large areas of native soil and rock that would contrast with surrounding vegetation and rugged, varied topography. During road construction and improvement activities, there would be an increase in construction traffic, equipment, and associated movement, and generation of dust.

During operations, there would be minor to moderate long-term visual impacts to the characteristic landscape associated with the Johnson Creek Route Alternative, because the widened and straightened
roads would visually contrast with the topography. Modifications to landform would be evident, and vegetation would be cleared along the roadway. New access road construction through the SGP would appear as flat to sloping, smooth, light-brown linear forms through the landscape, and appear consistent with other existing roads in the area and would be visible from KOP 4. The presence of vehicles on these routes would introduce movement to the landscape, and also provide access in a previously primarily roadless area.

The Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would provide a new viewer platform from which the SGP can be viewed. The Johnson Creek Route would consist of all existing roads; therefore, the level of visual change introduced to the landscape would be lower than that experienced as a result of the Burntlog Route under the 2021 MMP. Upgrades to both Johnson Creek and Stibnite roads would increase the level of visual contrast from the road due to road widening and straightening, as well as retaining walls that would transform the existing line and form along the road from a natural, vegetated slope to smooth, lighter-colored man-made walls.

The new road would cross an area managed as Partial Retention and road upgrades would cross areas managed as Retention and Partial Retention (Figure 3.20-2). With the exception of the retaining walls, access roads would generally conform to the Partial Retention VQO. Although new and upgraded portions of the access roads could introduce strong visual contrast in some areas, it typically would be limited to the immediate foreground as viewed from the road and would appear subordinate from other viewing platforms.

The types of permanent visual effects associated with the Johnson Creek Route Alternative would appear similar to those described under the 2021 MMP, although these effects would be in different locations. However, the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would not be reclaimed, and those areas would have permanent increased visual contrast on the landscape due to the presence of the new road segment. This also would provide a permanent viewing platform along the route.

Johnson Creek and Stibnite roads would not be returned to the pre-mine width, and the retaining walls, and culverts would remain after mine closure and reclamation activities have ceased. Therefore, the visual impacts associated with the Johnson Creek Route would remain as permanent impacts.

Effects by Key Observation Point

**KOP 1: Meadow Creek Lookout**

Construction and operations activity and traffic associated with the Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) link would be visible from KOP 1 but would largely be absorbed by the larger, more visually evident activity associated with the SGP that would appear dominant.

**KOP 4: Stibnite Road (CR 50-412)**

Under the Johnson Creek Route Alternative, visual impacts at KOP 4 would be the same as described under the 2021 MMP.
**KOP 6: Twin Bridges Dispersed Camping Area**

Short-term visual contrast from this viewpoint would result from road construction activities. Construction traffic, equipment, and staff would be evident from this viewpoint during construction, resulting in short-term minor to moderate visual contrast due to unobstructed views of construction activities in the foreground as viewed from KOP 6. It is likely that construction activities would preclude use at times and discourage use of the camping area at least in the short term.

Expansion of the roadway at this location would be highly constrained due to the proximity of the dispersed camping area to Johnson Creek. The widened roadway would appear co-dominant for viewers at this moderate-sensitivity dispersed camping area due to scale dominance. Similar form and line would be replicated along the roadway, resulting in a moderate level of visual change that would be evident to viewers in the foreground. Terrain in this area is relatively flat; therefore, landform changes associated road upgrades would result in a moderate, localized level of visual contrast. Overall, the long-term level of visual change would be moderate as a result of the wider road and would affect user experience at the dispersed camping area. Long-term, localized, moderate visual contrast would result from landscape modifications due to widening and straightening of the road.

**KOP 7: Idaho Centennial Trail at Johnson Creek Road (CR 10-413) and NFST 075**

KOP 7 represents views from the ICT directed west. This trail is identified as a sensitive level 1 use area and is associated with high visual sensitivity. Short term construction activity would include road grading and vegetation clearing on Johnson Creek Route near the trailhead to accommodate heavy vehicle mine traffic. Grading and construction equipment used for these activities would generate dust during dry weather that would be visible during the daytime. Impacts during construction would be similar to those described under KOP 6.

Johnson Creek Road (CR 10-413) would be plowed for year-round use under the Johnson Creek Route Alternative, and vegetation clearance along the road would increase in order to accommodate heavy vehicle mine traffic. These activities would increase the visual contrast of the road compared to existing conditions. Increased road use would generate dust during dry weather that would be visible during the daytime and headlights from mine traffic would be visible at night. Plowing the road during the winter would introduce a smooth, linear feature to the winter landscape that, under existing winter conditions appears similar to the surrounding natural, winter forest landscape. Additionally, large vehicles traveling the road during winter months would introduce movement and audible disruptions to the winter forest environment.

**KOP 8: Trout Creek Campground**

Construction activity associated with road improvements for the Johnson Creek Route would be visible, particularly when entering and exiting the campground. Construction traffic, equipment, dust, and movement of equipment and construction workers would contrast against the natural, and rustic environment of the campground. Impacts during construction would be similar to those described under KOP 6.
Due to road widening and frequent maintenance, the road would introduce a higher level of visual contrast to its surroundings due to its wider, smoother, and straighter appearance. Mine operation would create traffic to the SGP from buses, vans, trucks, and personal vehicles throughout mine operations. Nighttime traffic on this road would introduce new lighting into an area that has no permanent lighting sources. These long-term, localized, moderate impacts would primarily be experienced as individuals enter and exit the campground, although nighttime lighting could be visible from inside the interior of the campground.

**Utilities**

**Effects to the Characteristic Landscape**

However, helicopters would be used during construction of communication repeater sites and would periodically enter into view from the majority of the KOPs during construction and maintenance activities. Because the activity would be periodic and only for a short duration, visual changes would be negligible to minor during construction, operations, and closure and reclamation.

**Effects by Key Observation Point**

Effects by KOP would be the same as those described under the 2021 MMP.

**Off-Site Facilities**

**Effects to the Characteristic Landscape**

Under the Johnson Creek Route Alternative, proposed off-site facilities would be similar to those described for the 2021 MMP, except the maintenance facility would be located on the southern side of Warm Lake Road (CR 10-579) at Landmark. Appendix D of the Scenic Resources Specialist Report (Forest Service 2022n) shows the viewshed of the off-site facilities under the Johnson Creek Route Alternative.

**Effects by Key Observation Point**

**KOP 13: Landmark Maintenance Facility**

Short-term visual contrast perceptible to travelers on Warm Lake Road (CR 10-579) would result from construction of the maintenance facility, including grading, new buildings, and other facilities. Construction traffic, equipment, and staff would be evident from this travel route during pre-production, resulting in localized, moderate, short-term visual contrast perceived by receptors due to views of construction activities in the foreground.

The Landmark maintenance facility would result in moderate visual contrast where grading, vegetation removal, and construction of facilities would occur. The site is immediately adjacent to the historic Landmark Ranger Station, where there are existing cabins, picnic areas, and other structures currently managed by the PNF. Terrain at Landmark is primarily flat, with patchy clusters of trees and other low-lying vegetation. Existing disturbances are evident in the proposed maintenance facility footprint, and storage facilities would be co-located in these areas, which would help minimize visual contrast. Vegetation removal and some grading would be necessary to accommodate parking, outdoor storage
areas, and covered structures for storage. The maintenance facility would be visually co-dominant to receptors when viewed in the context of adjacent facilities at Landmark. The proposed layout of the maintenance facility would preserve existing tall vegetation along Warm Lake Road (CR 10-579), which would help screen the maintenance facility from sensitive viewers. Long-term visual contrast is anticipated to be moderate, and the facility would be viewed in the foreground with vegetation partially screening the site. Additional nighttime lighting would be introduced at this facility, which would contribute to sky glow in an area where existing night lighting is minimal.

The Landmark Maintenance Facility would be located in an area managed as Partial Retention (Figure 3.20-2). It would meet the Partial Retention VQO as buildings would be constructed using materials and colors that appear in the characteristic landscape. Additionally, due to surrounding vegetation, these facilities would typically not be visible past the foreground distance zone.

After reclamation activities have concluded at the mine site, the maintenance facility would be decommissioned and reclaimed to existing conditions. Buildings would be removed, and parking areas would be ripped, recontoured, and reclaimed. Over time, color contrast would be reduced to a low level of visual contrast once native vegetation becomes established. Permanent visual contrast would be low, and nighttime lighting would return to existing conditions, resulting in minimal permanent visual contrast.

**KOP 16: Stibnite Gold Logistics Facility**

Impacts at KOP 16 would be the same as described under the 2021 MMP.

### 4.20.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Scenic Resources.

### 4.20.4 Irreversible and Irretrievable Commitments of Public Resources

#### 4.20.4.1 No Action Alternative

Under the No Action Alternative, the proposed mine activities and construction and operation of associated infrastructure would not occur. Consequently, there would be no irretrievable and irreversible commitment of scenic resources.

#### 4.20.4.2 Action Alternatives

Both the 2021 MMP and the Johnson Creek Route Alternative would result in an irreversible loss of the characteristic landscape caused by the high walls of the open pits, where cut-slope color contrasts would persist permanently. Due to the size and extent of the TSF and TSF Buttress, an irreversible loss of the characteristic landscape would persist for a long period of time, until rock weathering and slope revegetation, if applicable, reduce visual contrast for color, form, line, and texture. Viewsheds for sensitive use areas near the SGP would be irretrievably changed due to the scale of topographic changes.
associated with the pits, TSF, and TSF Buttress. Even with reclamation and revegetation, the viewshed would be dominated by these unnatural landforms and those color contrasts that persist.

4.20.5 **Short-term Uses versus Long-term Productivity**

4.20.5.1 **No Action Alternative**

Under the No Action Alternative, the proposed mine activities and construction and operation of associated infrastructure would not occur, and there would be no additional short-term uses of the SGP area.

4.20.5.2 **Action Alternatives**

Short-term refers to uses with a duration of a few years or less. There would be no short-term uses that would affect long-term productivity of scenic resources.

4.21 **Social and Economic Conditions**

4.21.1 **Impact Definitions and Effects Analysis Indicators and Methodology**

The analysis of effects to social and economic conditions includes the following issue and indicators:

**Issue:** The SGP may impact the socioeconomics of Valley and Adams counties and the State of Idaho.

**Indicators:**

- Contributions to employment levels (total, State of Idaho, and Valley and Adams counties).
- Estimated value of projected mineral extraction.
- Estimated value of local income contributions.
- Estimated value of goods and services procured in Valley and Adams counties.
- Change in populations of Valley and Adams counties.
- Impacts to housing demand and affordability in Valley and Adams counties.
- Estimated tax revenue contributions.
- Changes in tourism and recreational based businesses.
- Changes in transportation, public services, and infrastructure.
- Effects on fisheries restoration programs

Other effects on tribes are described in the SGP Tribal Rights & Interests Specialist Report (Forest Service 2022q).

The Census’ 2014-2018 American Community Survey was used to identify the population and housing characteristics of all the communities within the analysis area. Five-year estimates were used to evaluate the analysis area’s communities because one-year estimates are only available for geographies with more than 65,000 people (Census 2018). American Community Survey data also was used to evaluate the three tribal communities located outside the analysis area with strong cultural associations and traditional use of the analysis area and surroundings.
The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

Social and economic conditions were analyzed using the Economic Impact Analysis of the SGP (Highland Economics 2018), Populations at Risk profiles (Headwaters Economics 2019a,b,c), Socioeconomics Baseline Study (Midas Gold 2017h), state and local tax and revenue data, Census data, GIS spatial analyses, scientific literature reviews, and other information and analysis documented in reports prepared for the SGP. Additional analysis also was performed when necessary to assess the validity of the data and analyses provided by Perpetua to confirm their findings. A complete discussion of the assumptions used in this analysis as well as the analysis limitations is provided in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o).

The SGP would result in direct and indirect socioeconomic effects on residents, workers, and communities within the local analysis area (i.e., Valley and Adams counties and associated communities of Cascade, Council, Donnelly, McCall, New Meadows and Yellow Pine). For the purposes of the socioeconomic analysis, the indirect impacts also include induced socioeconomic effects that are attributable to the SGP activities.

Direct impacts are defined as those that would occur directly from the SGP activities at the same time and place. For example, direct employment includes not only Perpetua employees but also other on-site construction workers that are employees of contractors hired for on-site construction or operational tasks. Indirect and induced impacts are defined as those that would be caused by an action but would occur later in time or would be farther removed in distance from the SGP activities. Induced effects are items that result from the direct and indirect effects. Given the remote locations of the SGP area and rural surrounding environment, most of the direct socioeconomics impacts are likely to occur within Valley County and the New Meadows area in Adams County. Analysis of statewide socioeconomic impacts from the SGP also are provided when appropriate.

4.21.2 Direct and Indirect Effects

4.21.2.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations. As a result, no new mine site and off-site facilities, access roads, or utility infrastructure changes would occur.

Current uses by other users on patented mine/mill site claims and on the PNF and BNF would continue in compliance with all existing applicable codes and regulations. These uses of NFS lands include mineral exploration, dispersed and developed recreation, such as pleasure driving, hunting, off-highway-vehicle use, camping, hiking, snowmobiling, bird watching, target shooting, firewood cutting, and other forms of recreation. Private businesses, such as outfitter and guide services, also operate on NFS lands through special use permits. Traditional cultural uses of the area would continue, including the collection of plants, hunting, and fishing. Access to public land in the area would continue as governed by law, regulation, policy, and existing and future land ownership constraints.

Perpetua would continue to implement surface exploration and associated activities that have been previously approved on NFS lands as part of the Golden Meadows Exploration Project (Forest Service
These approved activities include construction of several temporary roads to access drill sites, drill pad construction, and drilling on both NFS and private lands at and in the vicinity of the mine site. The continuation of approved exploration activities at the mine site would result in the continued use of the existing man camp, office trailers, truck maintenance shop area, potable water supply system, wastewater treatment facility, helipad and hangar, and airstrip.

Any impacts on recreation, infrastructure development, revenues, population, housing, and transportation impacts would be temporary and short term and no long-term changes to socioeconomic resources would occur (Forest Service 2015c).

4.21.2.2 2021 MMP

In response to concerns from the public over socioeconomic impacts, Perpetua has engaged with local communities and governments in a variety of ways including engagement meetings and agreements, and community outreach activities, a complete list of which are provided in the SGP Social and Economic Concerns Specialist Report (Forest Service 2022o).

In general, details of committed actions and potential future actions remain in development. While they are briefly mentioned here for context, actions are not considered in the development of impact conclusions in the analysis below until they are finalized.

Employment

Direct Employment

An important factor in determining the economic benefits to the local and state economy under the 2021 MMP would be the home residency of the workforce. The proportion of SGP jobs filled by local workers would determine the level of SGP wages that would benefit local residents and the amount of new income that would be re-spent in the local economy benefitting other local businesses (induced impacts). Highland Economics (2018) projected low, mid, and high values of local employee residency for each SGP phase; the range of low to high values during each phase of the Project is provided in Table 4.21-1. The mid-value employment projection is utilized for the impact analysis to represent the expected future economic impacts as it is representative of the anticipated workforce requirements for the 2021 MMP (M3 2021).

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<tr>
<th>Table 4.21-1 Projected Direct Annual Employment by Worker Residency and SGP Phase</th>
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</tr>
<tr>
<td>Construction (3 Years)</td>
</tr>
<tr>
<td>Value Range (Low to High)</td>
</tr>
<tr>
<td>Employment (Mid-Value)</td>
</tr>
<tr>
<td>Operations (15 Years)</td>
</tr>
<tr>
<td>Value Range (Low to High)</td>
</tr>
<tr>
<td>Employment (Mid-Value)</td>
</tr>
</tbody>
</table>
The local jobs (Valley and Adams Counties) would contribute to the local economy and could improve the standard of living for the employees and their families if wage rates are raised relative to their current jobs.

It is expected that most of the local construction workers would be adequately qualified and/or trainable for mine operations work and that many construction workers living locally or elsewhere within Idaho would likely accept mine operations jobs. These, and other local residents, would be adequately qualified for the general, administrative, and maintenance positions. These job categories account for approximately one-half of the SGP’s operations phase workforce needs (Highland Economics 2018). SGP employment under the post-operations phases would decline sharply from construction and operations phase levels. Perpetua has indicated that they could ramp up and ramp down employment in a measured way to result in a more gradual transition for local area residents and the economy (AECOM 2018).

The estimated number of SGP construction jobs for local residents are equivalent to 3.3 percent of the 2019 total employment for the local area of 5,777 (Idaho Department of Labor 2019). Operational, closure and reclamation, and post-closure employment represents 3.5 percent, 1.6 percent, and 0.3 percent, respectively of the local area’s total employment. The 2019 local unemployment rates (4.2 percent) and unemployed individuals in the labor force in Valley and Adams counties indicate while some of these positions could be filled by currently unemployed or under-employed local residents, it also is expected that many of the SGP construction jobs may be filled by non-local area residents that would choose to relocate to Valley or Adams County.

This local area employment increase would be expected to last for the duration of the mine operations phase; however, the post-closure decrease in employment and other related economic activity could result in adverse economic impacts on the local area’s economy from the “bust” following the prior “boom” from the SGP’s construction and operations employment and spending. When mine operations cease, local communities and economies may experience a contraction in demand for private and public goods and services and a corresponding reduction in demand for labor. Investment and capacity expansion that occurred during mine operations may become under-utilized unless new economic productivity and business opportunities develop in the region. Post-closure economic expansion and investment may happen if tax revenue or fees from mining can be effectively re-invested in community services and infrastructure, creating an environment conducive for long-term economic growth.

### Table: Employment Projections

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Local Residents (Valley/Adams)</th>
<th>Other Idaho Residents</th>
<th>Out of State Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closure and Reclamation (5 Years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value Range (Low to High)</td>
<td>-</td>
<td>40% to 70%</td>
<td>30% to 20%</td>
<td>30% to 10%</td>
</tr>
<tr>
<td>Employment (Mid-Value)</td>
<td>160</td>
<td>90</td>
<td>40 / 20</td>
<td>30</td>
</tr>
<tr>
<td><strong>Post-Closure (15 Years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value Range (Low to High)</td>
<td>-</td>
<td>40% to 70%</td>
<td>30% to 20%</td>
<td>30% to 10%</td>
</tr>
<tr>
<td>Employment (Mid-Value)</td>
<td>40</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Highland Economics 2018
Indirect and Induced Employment

The SGP would result in indirect and induced economic effects on the local analysis area’s economy. Increased sales for local suppliers providing construction materials and equipment represent an indirect effect of SGP activity and spending. Induced effects represent increased economic activity from household spending of labor income by both the SGP and supporting businesses’ workers.

The indirect and induced job projections for the SGP are based on national data on the relationship between employment and output for each affected economic sector. Depending on the specific state and local economic conditions, businesses operating at or under capacity, or facing limited increased demand, may increase their utilization of their existing employees rather than hire new workers. Highland Economics (2018) estimated the indirect and induced economic impacts from the SGP for both the State of Idaho and Valley and Adams counties combined local economy using an input-output economic model (IMPLAN). IMPLAN was used to estimate regional or local economic impacts and the data used are compliant with the Data Quality Act (Section 515 of Public Law 106-554).

Under the SGP mid-value scenario, the IMPLAN analysis estimated that up to 830 full and part-time indirect jobs would be supported within Idaho’s economy during the three-year construction period. Up to 570 full and part-time induced jobs also would be supported within the Idaho economy over the same period. As a result, it is projected that a total of 1,400 indirect and induced jobs would be supported annually in Idaho by the SGP during construction. Most of this employment would occur outside the local economy, as a total of 300 Valley and Adams counties jobs (180 indirect and 120 induced) of the 1,400 total are projected to be supported during construction (Highland Economics 2018).

Under the SGP mid-value scenario, IMPLAN analysis estimates that up to 310 full- and part-time indirect jobs within the State of Idaho would be supported during the 12- to 15-year period of operations. Over the same period, up to 370 full- and part-time induced jobs within Idaho also would be supported. As a result, it is projected that a total of 680 indirect and induced jobs would be supported annually by the SGP during operations. Most of this employment would occur outside the local economy, as a total of 270 Valley and Adams County jobs (150 indirect and 120 induced) out of the 680 total are projected to be supported by the SGP operations (Highland Economics 2018). Outside of Idaho, the total indirect and induced full and part-time jobs supported by the SGP would be approximately 1,430 (Highland Economics 2018).

The total local, state, and national indirect and induced full- and part-time jobs supported by the SGP would be approximately 4,050 (Highland Economics 2018). It is important to note that these are jobs and income supported by the SGP, but at the national level, these are not necessarily additional jobs and income in the U.S. compared to the No Action Alternative. If the capital and labor resources used for SGP’s development were instead invested in mining or other economic activities elsewhere within the U.S., there would be employment and income benefits generated from these alternative activities (Highland Economics 2018).

The indirect and induced job projections are based on national data on the relationship between employment and output for each affected economic sector. Depending on the specific state and local economic conditions, businesses operating at under capacity or facing limited increased demand may increase their utilization of their existing employees rather than hire new workers.
For closure and reclamation spending and employment under the SGP mid-value scenario, IMPLAN analysis estimated that, on average, approximately 20 full- and part-time indirect jobs within Idaho would be supported annually during this five-year phase. Approximately 40 full- and part-time induced jobs within Idaho also would be supported over the same period. Most of these jobs would occur within the local economy. A total of 10 indirect and 30 induced local jobs are projected to be supported within the Valley and Adams counties’ economy during closure and reclamation (Highland Economics 2018).

In addition, closure and reclamation activities after the first 5 years are expected to support approximately 20 full- and part-time indirect and induced jobs for Idaho residents per year during the 15-year duration, 10 of which are projected to be filled by local residents (Highland Economics 2018). The total local, state, and national indirect and induced full and part-time jobs supported by the SGP would be approximately 170 (Highland Economics 2018).

Employment Summary

Based on the direct, indirect, and induced employment impacts analyzed above, under the mid-value scenario, the overall statewide employment impact for the SGP is estimated to support 1,820 full and part-time jobs for Idaho residents annually during the 3-year construction period. The overall local employment impact during the 3-year construction phase is expected to provide 490 full and part-time jobs for the residents of Valley and Adams counties (i.e., 190 direct and 310 indirect/induced jobs). This local job impact would correspond to 8.7 percent of the local area 2019 total employment of 5,777 (Idaho Department of Labor 2020a, 2020b).

For the operating phase, overall statewide employment impact is estimated to support a total of 1,150 full- and part-time jobs for Idaho residents annually during the 12- to 15-year period of operations. The overall local employment impact of the SGP during operations is expected to total 470 full- and part-time jobs. This local job impact would correspond to 8.1 percent of the local area’s 2019 total employment of 5,777 (Idaho Department of Labor 2020a, 2020b).

For the closure and reclamation phase, overall statewide employment impact is estimated to total 190 full and part-time jobs during the first 5 years. The overall local employment impact during this period is expected to total 130 full- and part-time jobs, resulting in a corresponding decrease in total employment of 340 full- and part-time jobs from prior employment levels during operations. This local employment corresponds to 2.2 percent of the local area’s 2019 total employment of 5,777 (Idaho Department of Labor 2020a, 2020b).

For the post-closure phase of SGP, overall statewide employment impact is estimated to total 40 full- and part-time jobs during the additional 15-year period. The overall local employment impact of the SGP during this phase is expected to total 30 full- and part-time jobs. This local employment corresponds to 0.5 percent of the local area’s 2019 total employment of 5,777 (Idaho Department of Labor 2020a, 2020b).

The number of unemployed residents in the labor force in 2019 in Valley and Adams counties was approximately 349 (Idaho Department of Labor 2021). Therefore, the SGP could provide jobs to unemployed or under-employed residents in the labor force in those counties. The SGP also is expected to attract worker in-migration to the local area.
Such potential “boom and bust” effects from a mine’s closure are commonly recognized as potential source of adverse socioeconomic impacts on the local area economy. The impacts on the local area’s economy depend on employees’ responses after their mine employment ends, as well as their other employment opportunities. If the local area’s economy is strong and there are sufficient job opportunities with adequate earning potential for the unemployed mine workers, then the adverse economic impacts on the local economy could be limited if the unemployed mine operations workers are re-employed locally. While it may be difficult for the displaced mine workers to find equally high-paying replacement jobs, some individuals may be willing to accept less wages for job positions. As discussed in the Scoping and Issues Summary Report, Perpetua also has indicated that they could ramp up and ramp down employment in a measured way to reduce the “bust” effects on the local area residents and economy (AECOM 2018).

In addition, economic development planning, job-retraining, and other mechanisms can be used to facilitate the transition after the mine’s closure. However, in the absence of established funding and implementation commitments (either by Perpetua or state/local public agencies), potential adverse “boom and bust” impacts could occur.

When mine operations cease, local communities and economies may experience a contraction in demand for private and public goods and services and a corresponding reduction in demand for labor. Investment and capacity expansion that occurred during mine operations may become under-utilized unless new economic productivity and business opportunities develop in the region. Given the local analysis area’s largely rural and small economy, in the absence of adequate economic transition mitigation, the mine-closure related decrease in local employment and income could have an adverse impact on the local area’s residents, businesses, and overall economy.

Overall, the SGP is estimated to support 4,690 direct, indirect, and induced jobs for residents nationwide during the construction period, 2,690 jobs nationwide during the operations period, and 330 jobs nationwide during the closure and reclamation period (Highland Economics 2018). Employment impacts from the SGP would be beneficial, local and regional, moderate to major, and long term.

**Income**

**Direct Income**

**Construction**

**Table 4.21-2** shows the average annual construction spending on labor, materials, equipment, and services. Anticipated expenditures for the SGP also are broken out by their sourcing location.

Based on the projected total annual direct labor cost of $66.7 million, the average, fully-burdened compensation in 2017 dollars of all SGP employees (i.e., including management staff) is calculated to be $108,000 (Highland Economics 2018). This fully-burdened compensation accounts for overtime, as well as employee health and other benefits. The average wage for local residents is projected to be approximately $96,600 per year (in 2017 dollars) and is fully burdened to account for employee health and other benefits. The corresponding unburdened salary is estimated to be $67,700, which is comparable to the area’s prevailing Davis-Bacon rates of $20 to $30 per hour depending on the position (Highland Economics 2018).
The projected construction worker salaries and wages are considerably higher than the prevailing wages in the local area and in the Boise area, which average approximately $18 per hour (unburdened) for the construction and extraction sector and $16 per hour across all occupations (Idaho Department of Labor 2020a, 2020b). The average covered wage (i.e., for non-self-employed workers) statewide within Idaho is $43,480, $35,948 within Valley County, and $37,465 within Adams County. This high compensation rate for construction workers would partly reflect the specific work conditions and labor skill needs. Nonetheless, employment opportunities with the SGP would represent well-paying and attractive job opportunities for both local and non-local residents, as the average unburdened wage for employees ($67,700) would be 55 and 53 percent and higher than the average 2018 wage in Adams County and Valley County, respectively.

SGP employees and contractors would be expected to spend almost all their earnings in their community of residence, given their bi-weekly shift schedules and employee housing at the Operations Area Boundary’s remote location. As a result, the economic contributions to Valley and Adams counties’ economies would be related to the income earned by construction workers that live within the local area. The contribution of relatively well-paying local area employment and labor income from the SGP would result in increased spending and increased economic activity within the local economy during construction.

**Operations**

The SGP would mine a total of approximately 400 (356) million tons of ore and development rock from the Yellow Pine, Hangar Flats, and West End pits and would recover approximately 4.2 million ounces of gold, approximately 1.7 million ounces of silver, and 115 million pounds of antimony (M3 2021). Based on the 2018 to 2021 average mineral prices for gold ($1,600 per ounce), silver ($20 per ounce), and antimony ($3.50 per pound), the total future value of mineral production (after refining) would be estimated to be approximately $7 billion. The annual value of extracted minerals would be between approximately $350 million and $950 million per year over Mine Years 1 through 12 during operations (M3 2021).

**Table 4.21-2** shows the average annual spending on labor, materials, equipment, and services for SGP operations. Operations expenditures also are broken out by their sourcing location.

<table>
<thead>
<tr>
<th>Direct Spending</th>
<th>Total</th>
<th>Local</th>
<th>State Non-Local</th>
<th>State - Total</th>
<th>Out of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries &amp; Wages</td>
<td>$66.7</td>
<td>$17.4</td>
<td>$25.0</td>
<td>$42.4</td>
<td>$24.3</td>
</tr>
<tr>
<td>Vendor On-Site Operations</td>
<td>$17.7</td>
<td>$17.7</td>
<td>$0</td>
<td>$17.7</td>
<td>$0</td>
</tr>
<tr>
<td>Material, Equipment &amp; Services</td>
<td>$260.1</td>
<td>$27.2</td>
<td>$179.6</td>
<td>$206.8</td>
<td>$53.3</td>
</tr>
<tr>
<td>Total</td>
<td>$344.5</td>
<td>$62.3</td>
<td>$204.6</td>
<td>$266.9</td>
<td>$77.6</td>
</tr>
</tbody>
</table>

Source: Highland Economics 2018

¹Does not include direct labor expenses/income for vendor on-site workers and business proprietors.
Based on the projected total annual direct labor cost of $53.4 million, the average fully-burdened compensation of all SGP employees (i.e., including management staff) during operations is calculated to be $90,600 (in 2017 dollars) (Highland Economics 2018). This fully burdened compensation accounts for overtime, as well as employee health and other benefits. The average salary and wage for local residents is projected to be approximately $92,500 per year (in 2017 dollars) and is fully burdened to account for employee health and other benefits. The corresponding unburdened salary and wage is estimated to be $64,800, which is comparable to the area’s prevailing Davis-Bacon rates of $20 to $30 per hour depending on the position (Highland Economics 2018).

Table 4.21-3  Annual Operations Spending ($M/year, 2017 Dollars)

<table>
<thead>
<tr>
<th>Direct Spending</th>
<th>Total</th>
<th>Local</th>
<th>State Non-Local</th>
<th>State - Total</th>
<th>Out of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries &amp; Wages</td>
<td>$53.4</td>
<td>$18.7</td>
<td>$24.0</td>
<td>$42.7</td>
<td>$10.7</td>
</tr>
<tr>
<td>Vendor On-Site Labor</td>
<td>$2.3</td>
<td>$0.8</td>
<td>$0.8</td>
<td>$1.6</td>
<td>$0.7</td>
</tr>
<tr>
<td>Vendor On-Site Operations</td>
<td>$13.7</td>
<td>$13.7</td>
<td>$0.0</td>
<td>$13.7</td>
<td>$0.0</td>
</tr>
<tr>
<td>Material, Equipment &amp; Services</td>
<td>$165.3</td>
<td>$26.8</td>
<td>$48.1</td>
<td>$74.9</td>
<td>$90.4</td>
</tr>
<tr>
<td>Total</td>
<td>$234.7</td>
<td>$60.0</td>
<td>$72.9</td>
<td>$132.9</td>
<td>$101.8</td>
</tr>
</tbody>
</table>

Source: Highland Economics 2018

As with the construction phase, SGP employees would be expected to spend their earnings in their community of residence, given their bi-weekly shift schedules and employee housing at the mine site’s remote location. As a result, the direct economic impact to the Valley and Adams counties economies would be related to the income earned by the 200 operations staff that live within the local area.

Closure and Reclamation

Table 4.21-4 shows the average annual spending on labor, materials, equipment, and services during closure and reclamation and post-closure activities. Closure and reclamation and post-closure expenditures also are broken out by their sourcing location.

Table 4.21-4  Annual Closure and Reclamation Spending (2017 Dollars)

<table>
<thead>
<tr>
<th>Direct Spending ($M/year)</th>
<th>Total</th>
<th>Local</th>
<th>State Non-Local</th>
<th>State - Total</th>
<th>Out of State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Closure and Reclamation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries &amp; Wages</td>
<td>$6.6</td>
<td>$3.6</td>
<td>$1.7</td>
<td>$5.3</td>
<td>$1.3</td>
</tr>
<tr>
<td>Material, Equipment &amp; Services</td>
<td>$11.9</td>
<td>$1.2</td>
<td>$6.4</td>
<td>$7.5</td>
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</tr>
<tr>
<td>Total - Reclamation</td>
<td>$18.6</td>
<td>$4.8</td>
<td>$8.1</td>
<td>$12.9</td>
<td>$5.7</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Post-Closure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries &amp; Wages</td>
<td>$1.6</td>
<td>$0.9</td>
<td>$0.4</td>
<td>$1.3</td>
<td>$0.3</td>
</tr>
<tr>
<td>Material, Equipment &amp; Services</td>
<td>$4.3</td>
<td>$0.5</td>
<td>$1.6</td>
<td>$2.0</td>
<td>$2.2</td>
</tr>
<tr>
<td>Total - Closure</td>
<td>$5.9</td>
<td>$1.4</td>
<td>$2.0</td>
<td>$3.3</td>
<td>$2.6</td>
</tr>
</tbody>
</table>

Source: Highland Economics 2018
As with the construction and operations phases, SGP employees would be expected to spend their earnings within their community of residence, given their bi-weekly shift schedules and employee housing at the mine site’s remote location. As a result, the economic benefits to the Valley and Adams counties economies would be related to the income earned by SGP operations staff that live within the local area.

**Indirect and Induced Income**

**Construction**

SGP-related impacts from construction activities would result in indirect and induced income contributions to the statewide and local analysis area’s economies. Indirect income earnings would result from the increased sales and employment for the businesses that supply goods and services for construction. Induced income effects represent the local workers’ earnings resulting from increased household spending by both construction and support businesses’ workers.

Under the mid-value scenario, the IMPLAN analysis estimated that $44.3 million in indirect and $21.2 million (in 2017 dollars) in induced income, for a total of $65.5 million, would be supported within Idaho economy’s during the 3-year construction phase. Most of this income would occur outside the local economy. Construction activities are projected to support a total of $7.4 million indirect and $3.3 million per year (in 2017 dollars) in induced income within Valley and Adams counties’ economies during the 3-year construction period (Highland Economics 2018). Outside of Idaho, the SGP is projected to support a total of $191.8 million in indirect and induced income, resulting in a nationwide total of $257.3 million in indirect and induced income (Highland Economics 2018).

Based on an assumed full-time equivalent employment rate of 80 percent for projected indirect and induced full-time and part-time local jobs, the average salary for these workers (including benefits) is estimated to range from $34,400 (induced) to $51,400 (indirect) per year.

**Operations**

SGP operational spending and employment would result in indirect and induced income changes to the state and local analysis area’s economy. Under the SGP mid-value scenario, IMPLAN analysis estimates SGP operations would result in $15.7 million in indirect and $13.7 million in induced income annually in Idaho. Most of this income would be earned outside the local economy, as operations are projected to result in $7.6 million in indirect and $3.3 million in induced income within the two-county economy (Highland Economics 2018). Based on an assumed full-time equivalent employment rate of 80 percent for projected indirect and induced full-time and part-time local jobs, the average salary for these workers (including benefits) is estimated to range from $33,700 (induced) to $63,300 (indirect) per year.

**Closure and Reclamation**

Under the SGP mid-value scenario, IMPLAN analysis estimated that closure and reclamation activities would support $4.5 million in indirect and $5.3 million in total induced income. The majority of this induced income would occur outside the Idaho economy, as closure and reclamation activities are projected to support $1.1 million in indirect and $1.6 million in induced income out of the $4.5 million
and $5.3 million totals. Of the statewide totals, Valley County and Adams Counties residents are projected to receive $400,000 in indirect and $1.1 million in induced income. Based on an assumed full-time equivalent employment rate of 80 percent for projected indirect and induced full-time and part-time local job increase, the average salary for these workers (including benefits) is estimated to range from $41,700 (induced) to $50,000 (indirect) per year.

During the subsequent post-closure phase, it is projected that approximately $3.0 million in salaries and wages for indirect and induced workers would be supported by the SGP’s closure activities, of which approximately $500,000 would be expected to be received by Valley and Adams County residents (Highland Economics 2018).

**Income Summary**

Based on the direct, indirect, and induced income effects analyzed above, under the SGP mid-value scenario, the overall statewide income impact is estimated to contribute a total of $110.9 million per year during construction (in 2017 dollars). Of this total, the overall local income impact is projected to total $28.1 million per year for Valley and Adams County residents. Outside of Idaho, the SGP is projected to support a total of $215.5 million in direct, indirect, and induced income resulting in a nationwide total of $326.4 million in direct, indirect, and induced income (i.e., combined total of Idaho and elsewhere in the U.S.) (Highland Economics 2018).

Operations statewide total income impact during the 15-year period of operations is estimated to be $71.6 million per year. Of this statewide total, the overall local income impact is expected to total $29.3 million per year for Valley and Adams counties residents. Outside of Idaho, the SGP is projected to support a total of $114.8 million in direct, indirect, and induced income resulting in a nationwide total of $186.4 million in indirect and induced income (i.e., combined total of Idaho and elsewhere in the U.S.; Highland Economics 2018).

Closure and reclamation is estimated to support a total of $7.8 million in annual income statewide under the SGP mid-value scenario, with total local income expected to be $5.3 million. In total, the SGP is estimated to contribute $16.4 million direct, indirect, and induced income per year nationwide (i.e., $7.8 million in Idaho and $8.6 million elsewhere in the U.S.) (Highlands Economics 2018) during closure and reclamation.

As discussed under the employment impact analysis, adverse economic disruption and dislocation impacts could occur as result of the decrease in activity from the prior levels during the construction and operations phases given the local analysis area’s largely rural and small economy. These potential “boom and bust” effects after mine operations cease could result from reduction in 110 local jobs and corresponding decrease in local residents’ labor income by $14.9 million. In addition, the projected reduction in 230 indirect and induced local jobs could result in a corresponding decrease in local residents’ labor income by $9.5 million from the prior levels during mine operations. There would be a total local labor income decrease of approximately $24 million from the prior operations phase. The duration of this impact would depend on the affected workers and local area economy’s ability to adapt in response to the economic dislocation.
Income impacts would be beneficial, moderate to major, long-term, and local and regional.

Population and Housing

Project construction, operations, and closure and reclamation would affect the surrounding communities through local employment and income effects, which in turn would cause changes in population and housing needs of communities within the local analysis area. The peak effect would be realized during the construction period when predicted in-migration of approximately 450 workers would need housing. This effect would diminish following completion of the on-site worker housing facility and incorporation of portions of the in-migrating workforce into the local community. Any such population changes also would affect the level of community public services needed. The extent of induced population growth would be a primary factor determining potential economic and social impacts (e.g., increased housing and public services demand). As discussed above, it is projected that up to 500 total local jobs (i.e., direct and indirect/induced) would be supported by SGP construction activities (Highland Economics 2018).

If there are insufficient replacement job opportunities for the local residents no longer employed (directly or indirectly) following the “bust” impacts discussed above with cessation of the SGP operations, then the local area economy would experience increased unemployment and reduced economic activity. Depending on the severity and duration of the economic dislocation and recovery, many of the local residents formerly employed (direct or indirectly) by the SGP’s mine operations may choose to relocate out of the local area to find employment. There could be some adverse housing supply impacts from worker out-migration in the form of increased home sales and decreased tenancy/demand for rental properties, which might reduce property values if there is not adequate demand for their vacated homes. Housing impacts would be beneficial, minor to moderate, long-term, and local and regional; however, if future housing demand and supply conditions change, it may be possible that there could be adverse housing impacts to the local economy if any vacated properties remain unoccupied for an extended period of time.

Commuter and In-Migration Rates

Construction workers would be transported to the Operations Area Boundary by bus/vanpool pickup sites in Cascade, McCall, and Donnelly for their bi-weekly shifts (Highland Economics 2018). Most of these commuting employees would likely come from communities outside the local analysis area. It was assumed that most workers would reside in the Boise metropolitan area (approximately 75 miles and a 1.5-hour drive south from Cascade) or communities along Idaho SH 55 and U.S. Route 95 travel corridors that connect easily to the bus/vanpool pickup sites.

It is difficult to predict the actual extent and location of SGP-related in-migration to the local area, especially due to the mine site’s remote location and two-week shift staffing. The need or incentive for employee relocation to the local area is limited because most of workers would be housed on-site during their bi-weekly shifts. Idaho residents (particularly those living in rural areas) commute or travel long distances on a regular basis, as do many workers in the mining industry. In the absence of benefits inducing workers to live locally, SGP employees can choose from a wide variety of housing locations and base their housing decisions on factors including housing availability/affordability, local amenities, and social conditions, among others.
In-migration by SGP construction employees and contractors could be limited for several reasons. Existing local residents may be expected to fill a portion of the construction jobs, and, during their two-week work-shift, most employees would be housed on-site and, consequently, there would be no benefit from living within the local analysis area. Additionally, non-local communities closer to Boise would offer greater housing options, amenities, and public services options within a relatively close travel distance (i.e., less than two hours) from the proposed employee bus/van pool pick-up locations in Cascade, McCall, and Donnelly (Highland Economics 2018).

In-migration effects on indirect and induced employment can be expected to be weaker than direct employment effects. The wage rates for the indirect and induced jobs would be lower and more comparable to prevailing wage rates within the local area and elsewhere in the state. Generally, indirect and induced employment opportunities would be less specialized and less skilled. As a result, there would be a larger labor pool of potential employees for any new positions. Finally, given the relatively short-term nature (three years) of the new jobs from SGP construction activities, many businesses may meet increased business demands through more interim measures (e.g., overtime and increased facility/equipment utilization) rather than business expansion (e.g., new hires or facility expansion). Consequently, projected indirect and induced employment impacts may result in comparatively less attraction and incentives for in-migration to occur than that from the SGP’s higher paid and more secure job opportunities; however, the local area’s current relatively low unemployment rate increases the potential for future in-migration from indirect and induced job demand. Currently, there is only a limited labor pool of unemployed and under-employed local residents available to fill the projected new job positions.

As a result, this socioeconomic analysis identifies and evaluates the potential impacts assuming moderate in-migration rates under Highland Economics (2018) mid-value local worker residency scenario. Table 4.21-5 shows the existing resident and new in-migrant worker populations expected under the mid-value local worker residency scenario for each of the phases of the SGP (construction, operations, and closure/reclamation). New in-migrants relocating to the local analysis area could account for up to half of projected local direct employment and a third of the projected indirect and induced local employment. Construction activities are projected to potentially result in total in-migration of approximately 198 workers, most of which are estimated to be sustained during operations (190 in-migrants).

**Table 4.21-5 Projected Employment by Worker Residency and SGP Phase**

<table>
<thead>
<tr>
<th></th>
<th>Total Local Employees</th>
<th>Existing Local Residents</th>
<th>In-Migrant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>190</td>
<td>95 (50%)</td>
<td>95 (50%)</td>
</tr>
<tr>
<td>Indirect and Induced</td>
<td>310</td>
<td>207 (66.7%)</td>
<td>103 (33.3%)</td>
</tr>
<tr>
<td><strong>Total – Construction</strong></td>
<td>500</td>
<td>302</td>
<td>198</td>
</tr>
<tr>
<td><strong>Operations Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>200</td>
<td>100 (50%)</td>
<td>100 (50%)</td>
</tr>
<tr>
<td>Indirect and Induced</td>
<td>270</td>
<td>180 (66.7%)</td>
<td>90 (33.3%)</td>
</tr>
<tr>
<td><strong>Total – Operations</strong></td>
<td>470</td>
<td>280</td>
<td>190</td>
</tr>
</tbody>
</table>
Factors affecting relocation include housing availability and schools, as well as other amenities such as parks, restaurants, and recreation. Relocation is a personal decision based on interest, commute preferences, family make-up, and background. As a result, it is inherently difficult to reliably predict the future geographic distribution of the expected population growth. Potential relocation factors are further discussed in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022a).

Housing impacts may be adverse from the overall local area perspective, and concentrated new in-migrant population increases could result in greater impacts within specific communities – especially if those communities are not well equipped to absorb the new residents. For example, while McCall has 4,259 housing units, only 1,440 are occupied year-round by residents (Census 2018). If half of the projected new in-migrant workers selected McCall for their place of residence, that would represent an approximate three percent increase in the community’s population (3,226 people), which would likely represent and could be perceived by current residents as a noticeable and possibly adverse population effect. The potential for affordable housing impacts would depend on the number of lower-paid, in-migrants relocating to the specific community, discussed further below. As a result, if there is an insufficient existing inventory of suitable housing within the affected communities, adverse affordable housing availability impacts could result during construction activities. A lesser number of employees might be expected to relocate to Council or New Meadows, while few, if any, new employees and their families would be expected to relocate to the small communities of Yellow Pine or Donnelly, or elsewhere within the unincorporated and more rural areas of the two counties.

In-migration impacts would be negligible to moderate, long-term, and local and regional.

Population Demographics

Based on Idaho statewide averages, it is expected that 57 percent of the in-migrating workers would be married with an average of 0.64 child per capita (Census 2018). As a result, the 198 workers projected to relocate to the local analysis area during construction would be expected to result in a total population increase of up to 438 new residents, which would consist of 240 dependents (113 spouses and 127 children).

This in-migration worker population could increase new local housing demand by up to approximately 200 dwellings. Although, the actual total housing demand would be less if relocating workers opt to share
housing (either with existing residents or other in-migrating workers) or if in-migrating spouses also work on the SGP.

The potential for any such new housing demand to have an adverse impact on the local area’s affordable housing supply is a commonly held and understandable concern for many local residents (AECOM 2018). In addition, the local analysis area’s past population growth and in-migration rates also likely contribute to concerns of SGP-related adverse impacts on local affordable housing availability.

### Housing Availability and Affordability

Overall, there were a total 91 homes for rent, 138 homes for sale, and 92 “other vacant” home in Valley and Adams counties available for in-migrating workers in 2018 *(Section 3.21.4.2)*. The data suggests that most of the local housing has been sold to second home buyers, thereby increasing the number of occasional housing units and decreasing the availability of housing to local residents (Highland Economics 2018).

Most of the “occasional use” housing within Valley and Adams counties generally consists of more expensive second homes that may be unavailable or unsuitable for workers to rent or purchase, as these custom and/or newer homes are typically less affordable. Details on housing affordability are further discussed in the SGP Social and Economic Conditions Specialist Report (Forest Service 2022o).

An influx of new SGP employees and contractors into the local communities would increase local housing demand. In-migrating employees may live in dispersed areas of the two counties, limiting the effects on housing in any one location within the two-county area (Highland Economics 2018). Given their higher paying salaries, these in-migrating workers could rent or buy homes with values closer to the area’s median and market values. Although the 2018 quantities of homes for sale or rent is limited (321 homes), this supply exceeds the projected 95 new SGP construction workers expected to in-migrate to the local area. Since 2018 data, housing throughout western U.S. states has been affected by pandemic-era migration away from population centers (Hjerpe et al. 2020). Vacancy rates in Adams and Valley Counties have decreased by approximately 25 percent from 2018 to 2019. If this in-migration trend continues post-pandemic, there would be a general lack of housing that would be further affected by the housing needs of SGP construction workers. As a result, potential adverse housing availability impacts would likely predominantly result from the approximately 103 workers that may migrate into the local area for the indirect and induced jobs supported by SGP’s construction activities. Given the lower typical salaries for the indirect and induced jobs supported by construction activities, the workers in-migrating to the local area for these jobs could increase competition for lower-priced housing, which could in turn contribute to greater scarcity of affordable housing.

The number of currently available homes for sale or rent is limited (321 homes), and it is expected that the 90 to 95 projected new SGP operational and construction workers relocating to the analysis area should be able to afford to buy or rent these available homes. In which case, 226 unoccupied homes would be expected to remain available for the approximately 103 in-migrant non-SGP workers (i.e., indirect or induced workers) that are projected to relocate to Valley or Adams counties unless these homes are utilized by other housing demands. Adverse affordable housing availability impacts could result from construction and operating activities if there is an insufficient existing inventory of suitable housing within the affected communities, in which case, SGP construction activities could result in
adverse impacts to housing availability and affordability within the local area. In addition, this impact would be expected to occur primarily during the start of construction and/or operations phases and then subsequently stabilize in the absence of any further increase in local employment. Many factors affect the actual housing demand from in-migrating workers. These include the extent that SGP-related indirect and induced jobs might be filled by existing residents or SGP employee spouses, the extent that in-migrating workers would cohabitate, and where they would reside within local communities, which would in turn affect local housing demand and affordability for the local analysis area’s existing residential population.

Public Services

As described earlier in this section, construction and operations activities could attract a projected 420 to 438 new residents (workers and families) that could relocate to the local analysis area. This population growth would result in increased public services demand and use. The type and extent of the public service increases would depend on the demographics of the new residents. For example, the number and age of children relocating with in-migrating workers would determine increased enrollment impacts on the local public school system.

The population growth also would result in increased sales tax revenue (state and in some cases local), utility payments, and possibly property tax revenues (if existing property values appreciate or home development expands; discussed below under Government Revenues). Potential adverse impacts to public services may occur if the new residents’ service demands exceed the specific public service/program’s capabilities.

The local analysis area’s public water utilities and school systems have the most potential to be impacted by the expected population increases. The communities of McCall, Cascade, New Meadows, and Donnelly all provide water and sewer services for their residents, and addition of new permanent residents may, in some cases, increase stress on their systems. Community members have expressed concern about these impacts (AECOM 2018).

The public school system within the local area consists of several independent school districts located in McCall, Donnelly, Cascade, New Meadows, and Council. Under the mid-value worker residency scenario, it is projected that up to 121 children may relocate to the local analysis area during the project’s operations phase. In which case, the potential increase in school enrollment demand would be approximately 80 students as some relocating children would be younger than school age or opt for alternative schooling (Census 2015; Highland Economics 2018). If these new students are evenly distributed across grades, then the average enrollment increase per grade would be approximately six additional students in each grade.

As discussed in Section 3.21.4.6, Cascade and New Meadows are both under enrolled, while McCall and Donnelly currently do not have capacity for additional students (Idaho Department of Education 2019). The SGP-related influx of new students would correspond to an approximately six percent increase in local enrollment. If the in-migrating student population consists of more similarly aged children, then the increase for their corresponding grades would be higher and more likely to be difficult for the local school systems to accommodate. If this occurs, the adverse impact on the public school system could be substantial if the current programs and facilities have insufficient capacity to absorb that additional student enrollment. The specific effects on the number of teachers and classrooms would depend on the
actual ages and enrollment locations for new students. In Valley County, there are currently 52 middle and high school classroom teaching full-time equivalent positions with an average student-teacher ratio of 15:1 and 40 elementary school positions with an average student teacher ratio of 17.5:1 (Idaho Gazetteer 2021). If in-migrating students concentrated in the area, up to six full-time equivalent teaching positions would be needed to maintain current student-teacher ratios.

The population increase attributable to the SGP would result in effects to local police and fire protection services. Currently, there is a patrol officer for approximately 850 residents of Valley County (Valley County Sherriff’s Office 2021). There are nine Valley County fire departments that serve approximately 1,300 residents per department and six Adams County fire departments that serve approximately 730 residents per department. The specific effects of adding an estimated 438 residents on police and fire services would depend on the actual residential locations selected by in-migrating workers. If in-migrating workers concentrated closest to the mine area in Valley County, demands on police and fire services and equipment would increase up to 4 percent assuming the frequency of in-migrating worker service needs would be equivalent to the current population.

Adams and Valley counties’ telecommunications and internet infrastructure operate at near capacity and, therefore, may have difficulty in maintaining service levels from increased service demand in some locations.

Public service impacts would depend on both the location of any SGP-related population growth and the specific circumstances of the affected public services. It is possible that adverse public service impacts could occur to the local analysis area’s water and public school system, particularly if in-migrants are more highly concentrated in individual communities such as McCall. In which case, there could be localized, long-term, substantial adverse impacts to those public services; however, if the relatively limited projected population growth is not highly concentrated, then construction could have negligible to minor, long-term, and adverse impacts on most of the local area’s public services.

Valley County’s 2021 unemployment rate was relatively low (four percent). Adams County’s unemployment rate was higher at six percent in 2021 (Idaho Department of Labor 2021). While vacancies in these sectors might be more readily filled by Adams County’s unemployed or under-employed residents, it is likely that Valley County communities would provide a larger share of local employees and, therefore, receive greater benefit of higher wage jobs in construction and mining. Consequently, Valley County’s public agencies and service sectors also would have greater potential of possible adverse impacts from wage-inflation and/or understaffing. These jobs are important for the functioning of the local economies. A lack of employees able to fill these positions could negatively affect the local government service sectors, assuming new workers do not move into the area and government agencies have limited flexibility to adjust wages and/or increase funding to pay contractors.

Labor cost increases could adversely affect the capacity for public agencies that rely on lower paid, skilled workers for their operations (i.e., school bus drivers, garbage haulers, etc.) to continue providing their services. In addition to increasing their operating costs, in more serious cases, the labor shortages could result in business contractions and reduced public services if their work positions remain unstaffed. Contraction also could occur for private businesses relying on lower-wage or competing wage workers; however, businesses may have greater flexibility to react to increases in disposable income, adjust their
wage rates, attract new workers, and benefit from the influx of higher wage jobs. It also is possible that any adverse wage-inflation or staffing impacts would result in relatively short-term effects as the affected public agencies, private businesses, and local economy adjust their operations to the changes in labor force availability. These adjustments may occur during the both the mine construction and operation phases.

In the absence of any population or housing demand growth impacts, no related adverse impacts from increased demand for public services would be expected. Out-migration following cessation of SGP operations may have the potential for adverse impacts to public services if it results in underuse and/or underfunding for any facility expansion that occurred to serve SGP-related population growth (e.g., development of new utility connections or school buildings); however, the potential type and extent for both operational and post-operational impacts to public services would be dependent on the location of any SGP-related population growth and the capabilities of the specific public systems serving the new residents.

**Government Revenues**

Valley and Adams counties residents and businesses pay federal and state income taxes, federal payroll taxes, corporate taxes, and their purchases are subject to state sales taxes. In addition, the buildings within the local area owned by individuals and businesses are subject to local and state property taxes. Projected annual tax revenues resulting from construction and operations activities are summarized here and are further detailed in the Social and Economic Conditions Specialist Report (Forest Service 2022o).

The total annual government tax revenue benefits from construction activities are estimated to be $70.8 million per year and $212.4 million over the 3-year construction period. Perpetua is projected to pay $12.0 million of these taxes annually or $36.0 million over the construction period. The other $58.8 million per year in total taxes would be obtained from businesses and employees supporting the SGP. Over the entire 3-year construction period, the total taxes paid by SGP support businesses and employees are projected to total $176.4 million. The federal government is expected to receive most of total tax revenues resulting from construction activities. The state and local tax revenues generated are projected to total $9.3 million per year, of which the majority would be a regional, short-term, minor tax revenue benefit received by the State of Idaho. No property taxes would be paid by Perpetua until after the Operations Area Boundary facilities are completed and the mine operations begin. As a result, construction activities would result in negligible, short-term tax revenue benefits for the local area’s economy.

Annual government tax revenue benefits from SGP operations are estimated to total $61.7 million. Perpetua is projected to pay $29.4 million in taxes annually. The other $32.3 million would be paid by SGP support businesses and employees. The federal government is expected to receive most of the total tax revenues resulting from operations. Federal tax receipts during the SGP operations phase are projected to be $51.6 million annually and total $774 million over the entire operations period (based on a 15-year operations period). The state and local tax revenues generated are projected to be $10.1 million per year and total $151.5 million over the entire operations period. Most of these taxes would be received by the State of Idaho. Local tax revenues paid by Perpetua are projected to average $0.3 million per year and total $4.5 million over the entire assumed 15-year period of operations. In 2018, Valley County’s property
tax totaled $7.5 million; therefore, the SGP’s projected annual property tax would account for approximately 4 percent of Valley County’s current total property tax. As a result, operations would result in a relatively limited tax revenue increase for the local area’s economy with a negligible to minor, long-term, and localized impact.

Local property taxes may be used to fund local schools, local governments, local law enforcement, fire protection, local roads, and other public services. The extent that the SGP-related increase in local tax revenues would result in a net benefit to Valley County’s public services would depend on the extent that they offset increases in costs to provide public services.

It is expected that SGP’s reliance on public services would be limited, as it would generally self-administer on-site security and fire protection services. Perpetua would be responsible for roadway maintenance measures under a cooperative agreement with Forest Service and Valley County (Section 4.16). As such, there would be no increased cost to Valley County and its taxpayers as a result of any SGP-related roadway repair costs.

As discussed previously, public services demand impact would predominantly result from SGP-related local population increases (i.e., worker in-migration). In addition, operations could result in adverse impacts on government provision of services and staffing from wage inflation and local worker shortages for lower paying jobs within the local area, contingent on the ability of agencies and contractors to backfill staff losses over the longer period of operations, compared to the three-year construction phase (e.g., government agencies could lose personnel to SGP with uncertain capacity to backfill positions).

Estimated annual tax revenues resulting from closure and reclamation activities are summarized here and further detailed in the Social and Economic Conditions Specialist Report (Forest Service 2022o). The total annual government tax revenue benefits from closure and reclamation activities are estimated to be $1.5 million per year, of which the federal government is expected to receive the majority ($1.1 million per year). State and local taxes revenues generated are projected to total $0.4 million per year, of which the majority would be received by the State of Idaho. As a result, closure and reclamation operations would result in negligible, long-term, and localized tax revenue benefits.

**Transportation and Infrastructure**

**Transportation**

Changes in the local network of access roads and traffic use could potentially have socioeconomic impacts on the surrounding communities and their residents and businesses if it results in substantial changes in roadway use and/or user spending within those communities.

Construction, operations, and closure and reclamation phase impacts on the local analysis area’s transportation system from both use and network changes are analyzed in detail in Section 4.16. The socioeconomic impact analysis evaluates the nature and extent of projected travel redistribution and changes in traffic conditions to assess if they would result in corresponding economic changes for local area residents, businesses, and the local area’s economy.
During the three-year construction phase, no measurable socioeconomic effects on the local area economy are expected due to the affected roadway system’s remote location, very low use levels, and the limited traffic growth from construction activities. Traffic and access road details are discussed in Section 4.16. These roadway system changes have the potential to divert some recreational travel and spending from the village of Yellow Pine to other locations with access to the PNF and BNF. Traffic data on the number of annual recreationists travelling through Yellow Pine via this route is limited but is approximately 29 vehicles per day. This traffic likely includes current SGP employees and contractors accessing the mine site area as part of ongoing exploration activities. As a result, there is the potential for reduced economic activity in Yellow Pine from May through November from the project’s roadway system changes; however, it also may be expected that any of the spending from diverted recreationists would be spent locally elsewhere and recaptured by the local area economy.

While the roadway improvements may redirect some traffic within the local area, the improvements are not expected to induce significant new visitation. SGP changes to the local area’s roadway system and use are not anticipated to result in any major new economic activity or economic development. Consequently, the transportation impacts would have negligible, short-term, and localized socioeconomic effects on the local analysis area’s economy during construction.

The traffic increases during the 15-year operating period of the SGP are anticipated to be approximately the same as that projected during the construction phase. In addition, the roadway network would be generally the same under both the construction and operations phases, but the Burntlog Route would be the designated route for mine traffic and provide an additional route for public access to the SGP and the FCRNRW. Therefore, socioeconomic impacts from transportation during operations would be similar to those during the construction phase. As during construction, Perpetua would be responsible for roadway maintenance measures under a cooperative agreement with Forest Service and Valley County. As such, there would be no increased cost to Valley County and its taxpayers as a result of SGP-related roadway repair costs. Consequently, transportation impacts would have negligible, long-term, and localized socioeconomic effects on the local analysis area’s economy during the operations phase.

During closure and reclamation, less traffic increases would occur than during construction and operations and would be distributed across several routes within the local roadway network. Project socioeconomic impacts from transportation during closure and reclamation would be similar in nature but lesser in magnitude as those during the operations phase. Consequently, transportation impacts would have negligible, long-term, and localized socioeconomic effects on the local analysis area’s economy during the closure and reclamation phase.

Infrastructure

Other infrastructure changes, such as utility system upgrades, also could have socioeconomic impacts on surrounding communities depending on nature of the effects on local area residents and businesses.

All the transmission lines and electrical substations that would be upgraded or built as part of the SGP are located within remote and underdeveloped areas with no current operating businesses or other economic activities. Concerns have been noted that the service capacity increase from SGP upgrade to the local area utility infrastructure could attract and result in other new development within the local study area that would result in additional socioeconomic impacts; however, it is considered highly unlikely that any such...
induced development would occur, because utility service capacity is not considered a primary limiting factor to current economic development within the vicinity of the upgraded or new utilities. Consequently, no utility service capacity related impacts would occur from SGP utility service changes.

Tourism

Recreation and tourism are important sectors of the local area economy, as discussed under Section 3.19 and 3.21. The analysis of tourism to the area includes visitors from outside the area as well as seasonal residents who utilize the area for recreation and thus, contribute to the tourism economy.

Impacts to recreation are discussed in detail in Section 4.19. This section evaluates the potential impacts on tourism-related businesses and the region’s economy from expected changes to recreation due to construction activities. The specific effects of resource changes on recreational and tourism use would depend on how the changes influence visitor use decisions. Studies and economic models of correlated mining and tourism observe an interaction between the two industries with resulting positive and negative economic effects for tourism ranging from increased discretionary spending and travel accommodations to competition for labor and resources (Tourism Research Australia 2013).

SGP-related changes in recreation access or opportunities (i.e., recreation and wildlife conditions) could affect the local area’s economy through visitor and seasonal resident spending changes at local tourism businesses. The nature and extent of the impacts to the local area’s tourism economy would depend on the type and magnitude of SGP-related changes in local visitation and use. Non-local visitor and seasonal resident use changes would generally have greater potential to impact local tourism businesses due to their higher spending on goods and services than local residents.

SGP-related changes in recreation access (and consequently use) may result from both restrictions on the areas currently open to public use and/or changes in the local transportation system that affect users’ ability or inclination to travel to the local area’s recreational destinations.

SGP construction and operations would require imposition of the Operations Area Boundary. Public use would not be allowed within the 13,441 acres of public lands within the Operations Area Boundary. Existing dispersed recreational use and opportunities that occur in this area would be displaced to other locations in or adjacent to the analysis area. Once the Burntlog Route is constructed, access to recreation areas beyond the Operations Area Boundary, such as Monumental Summit and Thunder Mountain, would be available in addition to the route through the mine site which would provide public access with safety controls to preclude public interaction with mine equipment and blasting operations. As a result, there would be a short-term decrease in recreational use and tourism-related business revenues during the three-year construction phase to these areas resulting in a moderate, short-term, and localized impact.

Impacts on recreation opportunities at and around the mine site would begin during construction and continue until the mine was closed, the site reclaimed, and the area reopened for dispersed recreation use. Some displaced visitors may choose to continue recreating at their current locations in other National Forest areas, such as the South Fork area, rather than return to the mine site area due to permanent changes in the recreation setting within the Operations Area Boundary. Nonetheless, there would be no net loss in recreation opportunity for the local analysis area, and the socioeconomic impacts to the local analysis area’s tourism sector and overall economy based on recreational opportunity would be negligible,
long-term, and localized. It also is possible that SGP-related displacement of some specific recreational
use and visitation from areas near local communities, such as Yellow Pine or Warm Lake (e.g., re-routing
of groomed OSV trails), could reduce tourism spending at their businesses. Depending on the type and
magnitude of any such lost spending, it is possible that adverse economic impacts on individual
businesses and community economies could occur. These impacts could be negligible to moderate, long-
term, and localized.

More specifically, SGP construction would affect access to the operating areas of three outfitters and
guides as a result of the development of Burntlog Route and the OHV Trail, as well as the closure of
Stibnite Road and the Operations Area Boundary, discussed further in **Section 4.19**.

The Operations Area Boundary established during construction would remain in place during operations.
Public access through the Operations Area Boundary would be re-established during operations with
safety controls to prevent public interaction with mine mobile equipment and blasting activities. Through
access for the three outfitters impacted during the construction period would be restored. These SGP-
related changes could result in increased or decreased recreation visitation (either in numbers of visitors
and/or their recreation use). Use of the Burntlog Route and the Burntlog Maintenance Facility could
impact two and one outfitters respectively, due to their locations within their operating areas. Operations
impacts to the impacted outfitters are described further in **Section 4.19**.

Generally, it is expected that any impacted or displaced recreation would likely relocate to other National
Forest areas within the local analysis area. This outcome may be expected due to both the limited
recreation use levels of the affected areas where legacy mining disturbance dominates the existing
condition and the existing availability of alternate and comparable recreational areas and resources. As a
result, the corresponding change in recreation use under operations would have negligible, long-term, and
localized socioeconomic impacts to the local area’s tourism sector and overall economy.

During closure and reclamation, both the Operations Area Boundary and the Burntlog Route would be
reclaimed, and other Operations Area Boundary facilities also would be similarly decommissioned.
However, it would take years (20 or more) for major revegetation to occur and major physical features of
the operations would remain (TSF, buttress, and pit walls). As a result, some of the Operations Area
Boundary former facility sites would continue to appear disturbed. Consequently, the recreational setting
for these locations would likely be permanently altered and some recreational use may remain
permanently displaced to other more natural locations within the local area. Closure and reclamation
noise would attenuate to background levels within 0.5 mile, nevertheless reducing recreation
opportunities in these areas for activities that depend on a quiet, natural environment.

Until their completion, the impacts from closure and reclamation on recreation and tourism would likely
be unchanged from the operations; however, following completion of closure activities, restrictions on
visitation would no longer be in effect. Accordingly, the recreation use changes from reclamation would
have negligible, long-term, and localized socioeconomic impacts to the local area’s tourism sector and
overall economy.
**Fisheries Restoration Program**

The Nez Perce Tribe’s Department of Fisheries Resources Management (DRFM) operates Fisheries Restoration Programs in the vicinity of the proposed Operations Area Boundary such as the Johnson Creek Artificial Propagation Enhancement Project and its associated research program. Annual funding for the project and research is approximately $1.5 million from a total annual operating budget of $22 million and utilizes DRFM’s staff labor from the total group of 200 employees (Nez Perce Tribe 2019). The project produces up to 110,000 Chinook salmon smolts annually for direct release into Johnson Creek while the research program examines smolt-to-adult return rates and the utilization of hatchery rearing of wild fish to supplement fish populations.

Construction period usage of the Johnson Creek Road would increase traffic and activity on an existing roadway along portions of Johnson Creek where the fisheries restoration program is active. Project impacts regarding water quality and the transport of hazardous materials have the potential to affect the restoration efforts (Forest Service 2022f). However, the socioeconomic components for the restoration program (e.g., road access, employment) would observe negligible and short-term effects from the increased use of an existing roadway. Implications for tribal treaty rights and interests are described in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q).

**Other Costs and Benefits**

The SGP includes design and operational features intended to reduce impacts on water resources (streamflow, water temperature, and water quality) and aquatic habitat. These potential resource impacts are determined not to have quantifiable and/or monetizable impacts that can be incorporated as socioeconomic impacts. This is generally due to lack of discernable direct changes in human use that can be attributed to the resource changes in an area dominated by legacy mining impacts and disturbance as the existing condition.

The design and operations modifications would result in both incremental costs to the owner/operator (e.g., water treatment facility capital and operations and management costs) and benefits (e.g., improved water quality or probability of meeting water quality standards) due to their intrinsic, non-market value. More specifically, the expected water resource benefits are evaluated in the SGP Surface Water and Groundwater Quality Specialist Report (Forest Service 2022f) and the SGP Fish Resources and Fish Habitat Specialist Report (Forest Service 2022i).

While changes in these resources may have non-monetary value, these resource improvements are not expected to result in any human use changes (e.g., by recreational or by tribal member users) that can be quantified. Consequently, for the purposes of this socioeconomic impact analysis, the non-monetary benefits of such improved water quality and wildlife habitat would not have any socioeconomic effects. Similarly, the related fisheries and ecological/resiliency also are not recognized to have any socioeconomic effects for the purposes of this socioeconomic impact analysis.

In addition to the incremental non-monetary resource benefits discussed above, the owner/operator would incur some incremental capital and future operations and maintenance costs. Costs associated with the SGP would be primarily associated with the partial re-routing of Burntlog Route, construction and operation of the lime kiln on-site, and the addition of the road improvements for public access through the
Operations Area Boundary. Overall, the capital costs for the design and operations modifications would be a relatively limited additional incremental cost to the estimated $1.1 billion initial construction cost and the approximately $270 million annual operating cost, especially given the expected total future mineral production value over the SGP operating life.

4.21.2.3 **Johnson Creek Route Alternative**

Under this alternative, the access route to the mine for all phases of the SGP would be via the Johnson Creek Route. The Johnson Creek Route starts at the intersection of Warm Lake Road and Johnson Creek Road and includes the Johnson Creek Road and the Stibnite Road section of the McCall-Stibnite Road. Under this action alternative the Johnson Creek Route would be used as the primary route to the mine site during construction, operations, and reclamation/closure which would result in increased traffic on Johnson Creek and Stibnite roads. During the construction phase, AADT on Johnson Creek Road would increase from 57 to 122 and from 39 to 104 on Stibnite Road. This traffic growth would increase the noise and activity near campgrounds, dispersed camping areas, trailheads, and recreational residences adjacent to these roads which could change their recreation setting and reduce visitor recreation experiences. The village of Yellow Pine would experience an increase in truck traffic from SGP vehicle use of the Johnson Creek Route to the Operations Area Boundary throughout all phases instead of only the construction phase as under the 2021 MMP. Truck traffic increases along the Johnson Creek Route also could have some effects on other roadway users travelling along the roadway to and from Yellow Pine.

Temporary road closures on Stibnite Road would occur on a daily basis for 5 years during construction and periodically on the Johnson Creek Road as the road is improved to accommodate operations vehicles. These road closures would result in reduced access to recreation sites/areas, decreases in recreational opportunities/settings, decreases in tourism, and decreased recreation experiences. As a result of these impacts, visitors may be displaced from these areas during this alternative’s construction phase, resulting in negligible to major, long-term, and localized impacts.

Aside from access road construction and use differences, actions under the Johnson Creek Route Alternative are similar to those under 2021 MMP and, therefore, would impact most local area residents, businesses, and economy in predominantly the same way. Construction under the Johnson Creek Route Alternative would be 5 years, 4 years to upgrade and reconstruct Johnson Creek and Stibnite roads and 1 year to construct facilities at the Operations Area Boundary once heavy equipment access is available, and consequently would be 2 years longer than the 2021 MMP. The overall schedule of mining post-construction phases and activities under the Johnson Creek Route Alternative would be the same as the 2021 MMP. Similarly, the quantities of ore extraction and mineral recovery would be the same while future construction and operating expenditures under the Johnson Creek Route Alternative would be higher. The net additional construction cost of the Johnson Creek Route is estimated to total $62.5 million. Perpetua estimates that the overall net cost effect could reduce the SGP’s value by up to $174 million due to the combined capital, operating (i.e., longer haul routes and increased roadway O&M), and financial costs (i.e., resulting from the extended construction period and delayed operations) (Midas Gold 2019d); however, the related employment, income, population, housing, public services, and government revenue impacts (which would be predominately related to the increased construction and operations spending) would be marginally higher than those identified under the 2021 MMP.
Under the Johnson Creek Route Alternative, public road access through the mine during operations would be permitted and be similar to the 2021 MMP. As a result, the impacts during operations would be expected to be the same.

The minor relocation of Burntlog Maintenance Facility to Landmark would be expected to solely result in increased noise and visual impacts to the historic Landmark cabins.

The potential changes in socioeconomic impacts under the Johnson Creek Route Alternative analyzed for the socioeconomic analysis would be limited to those physical changes that could ultimately result in net changes in future visitor use and spending to the local area’s tourism sector, fish restoration projects, and overall economy (e.g., changes in roadway access). Upgrade and use of the Johnson Creek Route for the SGP’s future operations would reduce roadway-related surface disturbance, stream diversions, and wetland impacts compared to the 2021 MMP; however, the Johnson Creek Route’s greater proximity to Johnson Creek and the East Fork SFSR would increase the roadway disturbance and use within both avalanche-prone areas and RCAs and thereby could result in increased public safety and environmental risks and impacts associated with transportation-related incidents and spills. The combined and overall magnitude of these impacts is not expected to result in any human use changes (e.g., by recreational or by tribal member users). Consequently, for the purposes of this socioeconomic impact analysis, the non-monetary benefits of these design changes are not recognized to have any socioeconomic effects.

The village of Yellow Pine would experience an increase in future truck traffic from SGP vehicle use of the Johnson Creek Route to the Operations Area Boundary during operations. Truck traffic increases along the Johnson Creek Route (estimated to average 60 vehicles daily) also could have some effects on other roadway users travelling along the roadway to and from Yellow Pine. Roadway changes under the Johnson Creek Route Alternative might also result in redistribution of recreational and other traffic to other roads. Given the low use levels of these other roadways, the increase in traffic to local recreation locations would be limited. The additional SGP-related traffic along the Johnson Creek Route may displace some recreation use to other less noisy locations. Under this alternative, outfitters would not experience the adverse changes in their ability to access their operating areas.

The magnitude of the recreation use changes from these components of the Johnson Creek Route Alternative would be marginal and localized. As a result, overall recreational impact is anticipated to be minimal and, therefore, no net change in local area’s overall visitation and visitor spending would be expected. As a result, the tourism impact findings during the Johnson Creek Route Alternative construction and operations phases would be expected to be the same as those determined for the Burntlog Route construction phase. Overall, the Johnson Creek Route Alternative’s construction activities would have a negligible, long-term, and localized impact on the local area’s tourism sector and local economy.

With regard to other, non-monetary benefits, the use of the Johnson Creek Route would not incur any impacts to roadless area characteristics in the Black Lake, Burnt Log, and Meadow Creek IRAs that would be associated with the construction of the Burntlog Route.

Upon closure and reclamation activities, roadway improvements along the Johnson Creek Route would remain under this alternative. Traffic volumes and road closures would be reduced from construction and
operational phases. In addition, because the Burntlog Route would not be constructed under the Johnson Creek Route Alternative, the reclamation activity and long-term recreational resource impacts for that would be avoided.

4.21.3 Mitigation Measures
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Social and Economic Conditions.

4.21.4 Irreversible and Irretrievable Commitments of Public Resources

4.21.4.1 No Action Alternative
No irretrievable or irreversible commitments of public resources are anticipated under the No Action Alternative.

4.21.4.2 Action Alternatives
Implementation of the action alternatives would result in the commitment of natural and human-made resources for new infrastructure, mine operations, closure and reclamation, and other post-mining activities. The predominant commitment of resources would result from the mining, which would deplete the valuable mineral assets in the targeted ore bodies. Extraction and use of the non-renewable mineral resources would constitute an irreversible commitment; however, the SGP is proposed in a legacy mining area, where substantial habitat reclamation is needed. The SGP may mitigate some existing environmental impacts, which would improve their resource conditions.

Substantial labor and materials needs would be required throughout the life of the SGP – these are irretrievable. Utility upgrades and new infrastructure would be required to facilitate mine operations and reclamation of historically damaged areas. Legacy mine waste rock would be incorporated into new construction to the extent feasible. Contaminated areas would be remediated during new construction as required.

Implementation of the SGP would remove the land from other uses while it is in operation, but the use would eventually be reversed through reclamation. The temporary loss of the land’s availability for other uses during that period would be irretrievable.

4.21.5 Short-term Uses versus Long-term Productivity

4.21.5.1 No Action Alternative
Under the No Action Alternative, no activity associated with the SGP as proposed would be undertaken. Consequently, there would be no short-term use that would affect social and economic conditions, and no effect on long-term productivity.
4.21.5.2 **Action Alternatives**

The action alternatives would result in short-term use of the SGP area, and construction of new roadways in the SGP area. After closure, the Operations Area Boundary and new roads would be reclaimed/decommissioned.

Short-term uses of both the mineral resources and other natural and human-made resources (i.e., for construction, operations, and closure/reclamation) would represent a lucrative use of these resources. The socioeconomic value of the short-term use of the resources is represented by both the extracted minerals market value and the monetary cost of the resources used to mine them.

As a non-renewable resource, the mineral extraction activities would permanently reduce the site’s future productivity for mineral production and economic development potential; however, the activities would result in reclamation and environmental improvements of existing disturbances that would be expected to enhance other future use potential of the site in the long term.

Use of the Operations Area Boundary and other facility locations on NFS lands would also result in a short-term decrease in the acreage available for recreation. The mining activities and public exclusion from the Operations Area Boundary would result in short-term displacement of recreational use as well as changes in recreation opportunities and setting within portions of the local area. These changes to local outfitter businesses and their customers’ and other visitors’ recreation experiences changes would have the potential to result in short-term socioeconomic impacts on the local area’s tourism sector and economy.

After reclamation is completed, the Operations Area Boundary would be re-opened to public access and recreation. As a result, there would not be recreation access impacts to long-term use of the Operations Area Boundary, access roads, and other facility locations for recreation after mine closure; however, it is possible that long-term impacts to the recreation setting and recreation experiences (e.g., reduced wildlife populations) that could adversely affect local outfitter businesses and their customers’ and other visitors’ recreation experiences. If these changes result in adverse socioeconomic impacts on the local area’s tourism sector and economy, there could be a long-term reduction in the area’s economic productivity for future tourism use.

### 4.22 Environmental Justice

#### 4.22.1 Impacts Definitions and Effects Analysis Indicators and Methodology

The analysis of effects to environmental justice populations includes one issue and the following indicators:

**Issue:** The SGP may disproportionately impact minority or low-income populations.

**Indicators:**

- Number and size of minority populations affected.
- Number and size of low-income populations affected.
• Location of SGP facilities, including roads and transmission lines in relation to minority or low-income residents.
• Differences in access to public lands.
• Change in traditional Tribal practices and/or access to Tribal resources.

Impacts to environmental justice populations were analyzed using information from the Census 2013-2017 American Community Survey demographic data (the most recent complete data year available for this EIS) (Census 2017), Tribally sponsored research on Native American fish consumption (EPA 2016b), and information and analysis documented in the SGP specialist reports regarding Heritage Resources, Fish & Aquatic Resources, Social and Economic Conditions, Tribal Rights and Interests, Vegetation, and Wildlife (Forest Service 2022l, 2022i, 2022o, 2022q, 2022g, and 2022j, respectively).

For each identified environmental justice community, the analysis assesses if any SGP-related impacts would result in disproportionately high and adverse effects on minority populations and/or low-income populations.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

### 4.22.2 Direct and Indirect Effects

The following analysis of effects associated with environmental justice is considered in the overall context of communities and populations that might potentially be disproportionately adversely affected by the SGP. As discussed in Section 3.22, the following environmental justice communities were identified:

- Nez Perce CCD Subdivision;
- Fort Hall Reservation (reservation of the Shoshone-Bannock Tribes); and
- Duck Valley Indian Reservation (reservation of the Shoshone-Paiute Tribes).

Tribal access and uses of the region (including hunting, fishing, ceremonial and spiritual, medicinal, and intrinsic values) have long-standing and on-going subsistence and cultural importance for Tribal members.

#### 4.22.2.1 No Action Alternative

Under the No Action Alternative, no action would be implemented, and there would be no mine operations associated with the SGP. The No Action Alternative would not result in adverse impacts to environmental justice communities or Tribal members.

The exploration activities authorized under the Midas Gold Golden Meadows Exploration Project would continue in and near the vicinity of the SGP area. Areas affected by the Golden Meadows Exploration Project, future access to subsistence resources and uses would remain unchanged. As a result, no adverse and disproportionate impacts to minority or low-income populations are expected to occur under the No Action Alternative.
None of the Operations Area Boundary, access roads, utilities, or off-site facilities are on reservation lands, and no significant adverse biological impacts (e.g., wildlife and vegetation resources), public health impacts (e.g., contamination of fish in local streams), or other physical impacts (e.g., air quality and noise) would directly impact reservation lands and their Tribal environmental justice communities that are located outside of the 2021 MMP area. However, the 2021 MMP could affect Tribal members’ access to subsistence or traditional use of the lands within the SGP area. Currently, there is no restricted access on NFS lands in the SGP area. Some restrictions are in place on private lands. As a result, the potential for any adverse and disproportionate 2021 MMP-related impacts to the Tribal environmental justice communities would be limited to changes in access for Tribal members, and subsistence or traditional use of the lands during the project life.

Information received from the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes’ ethnographies indicate that areas, resources, and off-reservation rights of concern and importance include disruption of traditional practices, tribal world view, fishing rights in the SFSR watershed, including the East Fork SFSR, Meadow Creek, Fiddle Creek, West End Creek, and Sugar Creek. Tribally significant travel corridors and waterways are known: Old Thunder Mountain Road (FR 440); the East Fork SFSR system, which includes several streams; and the Riordan Lake shore. Traditional plant gathering locations or collection areas within the analysis area also were cited as important to the Nez Perce Tribe, but exact locations of these collection areas have not been shared. Other landscape features of importance include Riordan Lake and high points in the landscape (e.g., mountain tops and ridgelines) that have religious significance, and traditional plant gathering locations or collection areas.

As discussed in Section 4.12 and the Fishery & Aquatic Resources Specialist Report (Forest Service 2022i), entrainment by in-stream activities or manmade features, flow reductions, temperature changes, changes in habitat structure, water quality changes, and reduced access to suitable habitat may affect the distribution and relative abundance of fish populations in potentially affected streams. The potential for the 2021 MMP to cause changes in surface water quality from increased erosion and sedimentation, changes in temperature, and changes in general water chemistry (i.e., pH, temperature, major ions, TDS and dissolved metals, and organic carbon) are discussed in Section 4.9 and the SGP Water Quality Specialist Report (Forest Service 2022f). Effects on public, including Tribal member, access to the Operations Area Boundary for recreational opportunities, including fishing are discussed in Section 4.12 and the SGP Recreation Specialist Report (Forest Service 2022m).

Construction and operation of the 2021 MMP would impact access to traditional use areas and subsistence resources if they are located within the Operations Area Boundary. Public and Tribal member use would generally not be allowed in the mine site footprint, areas adjacent to the mine site (i.e., the Operations Area Boundary) (Figure 2.4-2). Approximately 14,221 acres of public lands within the Operations Area Boundary would become inaccessible to the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes once construction begins and would continue through closure and reclamation. SGP on-site and off-site facility construction and operation could also impact traditional use areas and subsistence resources through habitat loss; behavioral disturbance to wildlife from increased noise and human activity; concerns about contamination of resources; and avoidance by Tribal members of traditional use areas. Furthermore, safety considerations, equipment use, presence of workers,
construction-related traffic, and road closures may discourage and restrict use by Tribal members. However, construction of the Burntlog Route and the OSV groomed trails would facilitate access to other areas outside the Operations Area Boundary.

Previously accessible lands within the Operations Area Boundary would become inaccessible for a generation, thus potentially disrupt the transfer of place-based traditional knowledge from generation to generation. However, the Operations Area Boundary represents a small portion of the total area within the PNF and BNF (2.3 million and 2.6 million acres, respectively) available to the Tribes to conduct their traditional use and access subsistence resources. All other existing areas outside of the Operations Area Boundary would remain fully accessible for hunting, fishing, gathering, and other traditional land uses.

Public and Tribal access within the Operations Area Boundary would resume following closure of the site. However, reclamation could modify the fish, wildlife, and vegetation composition of the area compared to existing conditions. Therefore, traditional land uses could be altered by reclamation. Reclamation would also remove the new portions of the Burntlog Route and the OSV groomed trails along with any beneficial use of those routes for public and Tribal access to locations in proximity to the SGP or associated facilities.

In general, the 2021 MMP impacts to subsistence resource availability on Tribal communities with environmental justice concerns could potentially be adverse and would be moderate, long term to permanent, and localized.

The Tribes have multiple and inter-related interests and associations with the local area resources (e.g., religious, sacred site, traditional, and subsistence uses). Many of these interests also are inherently incompatible with any resource changes, including increased presence or alternate use of the local area by non-tribal individuals or entities. Unlike displaced recreational use, there are no substitute resources or replacement opportunities for location-specific Tribal interests and use of the local area. As a result, Tribal members are more likely to be impacted by local area resource changes than the general public. However, specific information from the Tribes regarding the exact nature, duration, and location of impacts on Tribal populations resulting from the excluded areas for the SGP and/or resource impacts is not available in the public domain. Based on the ethnographic information provided to the Forest Service by the Tribes, it is expected that the 2021 MMP-related impacts would be of a type and/or magnitude to represent an adverse environmental justice impact to the Tribal environmental justice communities. **Section 6.2.3**, Tribal Consultation and Government-to-Government Consultation, describes the efforts the Forest Service has made to involve local Tribal governments and to solicit their input regarding the 2021 MMP. Consultation is ongoing, and the Forest Service will continue to engage with the Nez Perce Tribe, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes to develop ways to avoid, minimize, and mitigate effects to tribal rights and resources that would be impacted by the 2021 MMP.

### 4.22.2.3 Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the potential for any adverse and disproportionate impacts to the Tribal environmental justice communities are expected to be limited to changes in Tribal member access and subsistence or traditional use of the lands.
Under the Johnson Creek Route Alternative, the negative and positive effects of construction of new sections of the Burntlog Route on public and Tribal access would not occur. Long-term project use of the Johnson Creek Route would increase the duration and potential for direct and indirect effects on environmental resources in the vicinity of the Johnson Creek Road and Stibnite Road and their use by Tribal community members.

The impacts to subsistence resource availability on Tribal communities with environmental justice concerns could potentially be adverse and would be moderate, long term to permanent, and localized.

4.22.3 Mitigation and Monitoring
Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Environmental Justice resources.

4.22.4 Short-term Uses versus Long-term Productivity

4.22.4.1 No Action Alternative
The SGP would not be implemented under the No Action Alternative. Consequently, there would be no short-term use that would affect minority or low-income populations, and no effect on long-term productivity.

4.22.4.2 Action Alternatives
Use of the SGP and other facility locations in NFS lands would reduce Tribal member access to traditional use areas and subsistence resources; provide new and/or improved road access to the SGP area and vicinity; and facilitate increased public and Tribal member use of NFS lands, particularly for recreational users, as a result of the 2021 MMP and Johnson Creek Route Alternative road improvements.

As described in the companion Short-term Uses versus Long-term Productivity sections for the other resources analyzed, it is expected that the original land uses, including Tribal uses, would be reclaimed in the SGP areas where specific land uses for the action alternatives would be reclaimed (e.g., Burntlog Route, access roads, transmission line ROW). Therefore, long-term disproportionate effects on Tribal communities with environmental justice concerns would only be related to any differences in the reclaimed conditions of fish, wildlife, and vegetation resources in the area compared to existing conditions.

4.22.5 Irreversible and Irretrievable Commitments of Public Resources

4.22.5.1 No Action Alternative
The SGP would not be implemented under the No Action Alternative. Consequently, there would be no irreversible or irretrievable commitment of resources.
4.22.5.2 Action Alternatives

Based on the ethnographic information provided by the Tribes regarding traditional cultural properties, sacred sites, and traditional resource collection areas, it is expected that the action alternatives would cause irreversible impacts to those locations present within the disturbance footprint of the 2021 MMP and Johnson Creek Route Alternative (Battaglia 2018; Lahren 2020; Walker 2019).

Temporal loss of the area for hunting, fishing, gathering, and other traditional uses by Tribal members would be irretrievable. In addition, removing access to a culturally important area for approximately 20 years over the life of the 2021 MMP and Johnson Creek Route Alternative could result in the irretrievable and irreversible loss of cultural practices and identity to a generation of Tribal members.

4.23 Special Designations

4.23.1 Impact Definitions and Effects Analysis Indicators and Methodology

Significant issues are those which are used to formulate alternatives to the Proposed Action and to develop mitigation measures. No significant issues were identified for special designations. Although special designations was not identified as a significant issue, it was identified by the public, the Forest Service, and cooperating agencies as a relevant consideration. The analysis of effects for Special Designations include the following issues and indicators:

**Wilderness Issue**: The SGP could change the quality of wilderness character in designated or recommended wilderness areas.

**Wilderness Indicators**:

- Distance of SGP facilities from designated or recommended wilderness.
- Distance of designated or recommended wilderness from sights and sounds of human activity.
- Change in opportunities for self-reliant recreation within designated or recommended wilderness.

**WSR Issue**: The SGP may affect WSRs.

**WSR Indicators**:

- Free-flowing conditions for eligible and suitable WSR segments;
- Water quality for eligible and suitable WSR segments;
- ORVs for which eligible and suitable WSR segments are designated or nominated;
- Potential changes to classification of eligible and suitable WSR segments as Wild, Scenic, or Recreational.

**IRA Issue**: The SGP may impact roadless character in IRAs and lands contiguous to unroaded areas.

**IRA Indicators**:

- Miles and acres of roads in IRAs or contiguous unroaded lands.
• Number and acres of SGP facilities in IRAs or contiguous unroaded lands.

RNA Issue: The SGP could impact research values or ecosystem conditions within RNAs.

RNA Indicator:

• Change in vegetation community composition and structure within an RNA.
• Change in number of vehicles using roads and human activity within or immediately adjacent to an RNA.
• Changes to water quality (chemistry, temperature) or quantity within an RNA.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.1-1.

4.23.2 Direct and Indirect Effects

4.23.2.1 No Action Alternative

Wilderness

The use and character of the FCRNRW and recommended wilderness areas would continue as projected in the FCRNRW Plan and the Payette and Boise Forest Plans. Under the No Action Alternative, none of the approved exploration or planned ASAOC activities would be conducted within the FCRNRW boundary or recommended wilderness boundaries. There would be no measurable effects under the No Action Alternative on the five qualities of wilderness character in the FCRNRW or recommended wilderness areas.

Wild and Scenic Rivers

Planned ASAOC activities would still be implemented. Current uses by Perpetua on patented mine/millsite claims, and on the PNF and BNF would continue. Concurrent uses of NFS lands include mineral exploration, and dispersed and developed recreation, such as pleasure driving, hunting, OHV use, camping, hiking, snowmobiling, bird watching, target shooting, firewood cutting, and other forms of recreation. Traditional cultural uses of the SGP area would continue, including hunting, fishing, and the collection of plants for basket-making, food, and medicinal uses. Access to public land in the area would continue as governed by law, regulation, policy, and existing and future landownership constraints. Current access to the area, via Johnson Creek Road and Stibnite Road, would remain. Existing road access to Recreational river segments would not change, and existing effects to Wild segments would continue, including ongoing noise and sediment impacts from existing summer use. Traffic on Burntlog Road would remain largely recreational. No winter plowing of the road would occur, and snowmobiles would continue to use it.

Inventoried Roadless Areas

Approved mineral exploration adjacent to, but not within, Meadow Creek, Horse Heaven, and Sugar Mountain IRAs would continue. Planned and approved ASAOC activities would also still be conducted. As such, the roadless character within the 13 IRAs would be the same as existing conditions.
Research Natural Areas

The following analysis of effects associated with RNAs is considered within the overall context of vegetation and hydrologic conditions within the RNA analysis area. The purpose of the analysis is to disclose the potential effects on the research values, ecological site conditions, and processes in the two RNAs within the analysis area.

Perpetua would continue with exploration, monitoring, and reclamation commitments as described in the Golden Meadows Decision Memo and EA. Belvidere Creek, the RNA nearest to the SGP operations area, is approximately 6 miles north. Fugitive dust generated from vehicles and reclamation activities would attenuate within 300 feet of unpaved roads (Watson 2000). The distance of approximately 6 miles between the Belvidere Creek RNA and SGP reclamation and monitoring activities precludes the potential for fugitive dust and non-native invasive plant species establishment that could result in the loss of research values, ecological site conditions, and ecological processes within this RNA.

The spread of non-native invasive plant species varies based on each species characteristics. The distance from the mineral exploration and seeding of disturbed areas to any of the RNAs is more than 5 miles. The distance and the NFS and Valley County roads used for access reduce the potential for SGP activities to spread non-native invasive plant species into the RNAs. Therefore, there would be negligible direct or indirect effects on the hydrologic conditions, vegetation communities, or the research values within the RNAs from the No Action Alternative.

Warm Lake Road, Johnson Creek Road, and Stibnite Road would be used to access the SGP for exploration and monitoring activities in the summer. Motor vehicles and personnel using these roads or conducting maintenance activities could transport non-native invasive plant species seeds and propagules. Chilcoot Peak, the RNA nearest to Johnson Creek Road, is approximately 3 miles east of Johnson Creek Road, where aggregate and road maintenance activities would be conducted. The distance reduces the potential for fugitive dust and invasive plant species to spread within the Chilcoot Peak RNA from conducting road maintenance activities. Therefore, there would be negligible direct or indirect effects on research values or ecosystem conditions within the RNAs from the use of existing roads or their maintenance.

4.23.2.2 2021 MMP

Wilderness

The following activities could affect the wilderness character qualities of untrammeled, natural, undeveloped, and solitude or a primitive unconfined type of recreation: Mine site facilities; Access roads; and New transmission line. There is a measurable effect on designated wilderness and recommended wilderness areas at the following locations:

- Burntlog Route, Riordan Creek Segment – A 5.3-mile segment of the Burntlog Route would be routed high up in the Riordan Creek drainage, where it would cross Riordan Creek north of Black Lake.
• Public Access through the SGP – Public access through the SGP from Stibnite Road (CR 50-412) to Thunder Mountain Road (FR 50375) during mine operations would be provided by constructing a 12-foot-wide gravel road to connect Stibnite Road to Thunder Mountain Road. The route would be open to all vehicles year-round.

• Limestone Processing – Lime and crushed limestone would be produced on-site from mining a limestone formation in the West End pit.

Untrammeled

While no structures or facilities would be developed inside the FCRNRW, the untrammeled quality of wilderness character could be impacted by the SGP facilities and access roads. Construction, operation, and closure and reclamation could change soundscapes or natural dark sky conditions in the FCRNRW. The extent where the SGP facilities and access roads could change soundscapes or natural dark sky conditions is influenced by topography and weather.

Noise from SGP activities, an increase in human activity, or additional traffic on roads could change wildlife species natural distribution within the FCRNRW. The disturbance to wildlife species along or near the Johnson Creek Route would be short-term. Sound from mechanical equipment at the SGP and daily Burntlog Route maintenance could change natural wildlife species distribution in the Big Chief drainage within the FCRNRW. Constructing Burntlog Route close to the FCRNRW boundary (i.e., along Riordan Creek) could increase areas where noise and lights from vehicles could be audible and visible within the Big Chief Creek drainage. During the 3 years of construction and 15 years of operation, the natural distribution of wildlife species in the FCRNRW in habitats adjacent to the Johnson Creek Route (during construction) and Burntlog Route could change (IDFG 2019). Noise from blasting at the SGP would attenuate to the threshold of 55 dBA at 2.2 miles on distance alone but accounting for topography and atmospheric absorption, would attenuate to 55 dBA approximately 0.78 mile from the source (Forest Service 2022d). Blasting noise at the mine would be intermittent during the 15 years of mine operation. Noise from Burntlog Route summer maintenance would attenuate to the threshold of 55 dBA at approximately 0.42 miles based on distance alone and noise from Burntlog Route winter maintenance would attenuate to the threshold of 55 dBA approximately 0.54 mile from the source of activity. However, accounting for ground absorption and atmospheric absorption, noise from summer road maintenance would attenuate to 55 dBA approximately 0.22 mile away and noise from winter road maintenance would attenuate to 55 dBA approximately 0.27 mile from the source of activity. Burntlog Route maintenance and associated noise would be limited to between 7:00 a.m. and 10:00 p.m. Topography, and to a lesser extent vegetation, between the FCRNRW and blasting in the open pits and mine operation would reduce the distance noise from these activities are audible (Brüel and Kjaer 2000). The ridge between Burntlog Route cut and fill slopes and the FCRNRW boundary would influence noise intensity and block where headlights from vehicles on Burntlog Route could be visible within the FCRNRW.

Lights used during mine construction, operation, and closure could result in skyglow, changing natural dark sky conditions. There could be temporary impacts on night sky conditions from construction lights at the SGP and vehicle headlights. Lights from vehicles on Burntlog Route would be visible within the upper elevations of Big Chief Creek within the FCRNRW. Topography and vegetation could block or
filter lights, reducing the area where lights are visible (Larkin 1996). The extent of change to natural dark skies from lights during mine operation and vehicle headlights on Burntlog Route is unknown. EDFs (Section 2.4.9) to shield lights would reduce the area where mine operation lights change natural dark skies.

Human activity at the SGP would increase to accommodate the mine’s year-round 24-hour a day operation schedule. Increasing human activity at the SGP and from the potential public use of Burntlog Route could alter wildlife species migration into habitats in the FCRNRW. The use of Burntlog Route could increase the number of people recreating and hunting in wildlife habitats adjacent to or in the FCRNRW. Increased human activity could change wildlife distribution. The extent wildlife distribution would change is influenced by the type of activity, vegetation, and species (Taylor and Knight 2003; Wisdom et al. 2018).

The untrammeled quality of wilderness character would be impacted when noise and lights change wildlife species distribution and behaviors. Noise from mine activities, vehicles on Burntlog Route, and changes to natural dark skies during construction, operation, and closure and reclamation activities could result in a long-term change in wildlife species natural distribution. The duration could be short-term as some individuals of wildlife populations become habituated to noise, lights, and human activity.

Noise from recontouring slopes during the decommissioning of the Burntlog Route and returning Meadow Creek Lookout Road (FR 51290) to the existing width could be audible within the Big Chief Creek drainage. Noise from recontouring slopes, removing buildings at the SGP, and Burntlog Route decommissioning would attenuate to the threshold of 55 dBA approximately 0.57 miles from the source of activity based on distance along. Accounting for topography and atmospheric absorption, noise would attenuate to 55 dBA approximately 0.28 mile from the activity (Forest Service 2022d). Noise from recontouring slopes or decommissioning Burntlog Route would be temporary. These activities would be completed within a few days or weeks in a specific area, and, as activities ended, wildlife species distribution could return to pre-disturbance conditions. The duration of changes to wildlife species distribution after closure and reclamation activities cease would depend on species sensitivity to disturbance.

Although no structures or facilities would be developed inside the FCRNRW or recommended wilderness areas, there would be minor to moderate and short to long-term impacts, depending on the location of the impacts, to the untrammeled quality of wilderness character as described above by associated noise and lights from the SGP.

Natural

Plants

During construction, the 65 mine-related vehicles per day using Johnson Creek Route could transport non-native plant species and could become established and spread into the FCRNRW. Removing vegetation and disturbance of soils during the construction of Burntlog Route could also spread non-native plant species (Forest Service 2019b). Constructing the Burntlog Route close to the FCRNRW boundary could increase the potential for non-native plants to become established within the FCRNRW. Within the headwaters of Riordan Creek, Burntlog Route cut and fill slopes would be approximately 100
feet from the FCRNRW boundary. This approximately 5.3-mile-long segment of Burntlog Route would be downslope of the FCRNRW boundary. This shorter distance between disturbed areas and the wilderness could increase the risk of non-native plant species spreading into the FCRNRW. The public access road through the SGP could indirectly increase recreation use in the FCRNRW. Vegetation established during the interim reclamation of disturbed areas could reduce opportunities for invasive species to establish (Foltz 2012; Gornish et al. 2016; Romme et al. 2003).

During the 15 years of mine operation, approximately 50 mine vehicles per day, on average, would use the Burntlog Route. This traffic and daily maintenance activities also could disperse non-native plant species or remove vegetation along the roadside. During the decommissioning of Burntlog Route, surface disturbance and removal of vegetation established during interim reclamation could provide opportunities for non-native plant species to become established and spread. In addition, equipment used during decommissioning could disperse non-native plant species. Reclamation could impact the “natural” quality of wilderness character if the non-native annual plant species included in the seed mix spread into the FCRNRW (Morris and Schupp 2009). Reclamation of disturbed areas, which involve revegetation on NFS lands, would be done according to Payette or Boise Forest Plan Standards and in coordination with a Forest botanist.

During Burntlog Route construction, operation, and closure and reclamation, dust and sediment could be deposited on vegetation within the FCRNRW. Dust and sediment deposition in areas of the FCRNRW adjacent to Burntlog Route could change vegetation community composition within the FCRNRW. Limiting mine traffic to a 25-mile per hour speed limit (Section 2.4.9), could reduce the amount of dust generated. The extent of dust and sediment deposition is unknown; however, the changes in vegetation would result in a long-term impact on the natural quality of wilderness character within the FCRNRW.

Burntlog Route would be open to public use during the 15 years of mine operation and 5 years of mine closure and reclamation (Rew et al. 2018). Recreation use could increase in areas of the FCRNRW accessed from trailheads along Burntlog Route. Due to mine construction and operation, recreation use could increase in recommended wilderness areas if forest visitors avoid areas of FCRNRW. Recreation equipment and vehicles could disperse non-native plant species seeds (Pickering et al. 2010; Taylor et al. 2012; Rew et al. 2018). Indirectly, the natural quality of wilderness character in the FCRNRW and recommended wilderness areas could be impacted if recreation use spreads non-native plant species.

The public access road through the SGP would be open to all vehicles year-round. Public use is expected to be seasonal because the destination areas for the public are generally inaccessible between December and May. Recreation equipment and vehicles could disperse non-native plant species. The potential increase in recreation use under the 2021 MMP either on Burntlog Route or the public access road is unknown. Where established, non-native plant species would have a long-term effect on vegetation communities within the FCRNRW. Applicable EDFs (Section 2.4.9) would be implemented to reduce the potential for non-native plant species to spread. The natural quality of wilderness character could decrease within the Big Chief Creek drainage.

In the long-term, the introduction of non-native plant species could change the composition of native plant communities. The potential for non-native plant species to spread depends on the specific characteristics and local site conditions (Zouhar 2003). The extent non-native plant species could spread...
and the duration these species could persist in native plant communities is unknown. The natural quality of wilderness character would be impacted if non-native plant species became established within the FCRNRW or recommended wilderness areas.

**Fish and Wildlife**

During construction, operation, and closure and reclamation of the Burntlog Route, vegetation removal and excavation of soil and rock could increase sediment load into Big Chief Creek tributaries and affect fish and aquatic habitat. Erosion control measures, such as sediment fencing, ditch checks, and other measures, would reduce erosion from the road into the tributaries. There could be a long-term risk to fish and aquatic habitats from the accidental spill of material, such as fuel or mine processing chemicals, where Burntlog Route crosses a Big Chief drainage tributary. The extent of impacts to aquatic habitat would be from the site of the spill downstream to the point of dilution. The measures included in the SPCC Plan would reduce the potential for a spill to reach downstream waters.

In the short-term, the SGP would result in an estimated 104 AADT, from the 65 mine-related vehicles, on Johnson Creek Route during the first 2 years of construction. Based on the estimated traffic volumes and vehicle mix, and typical vehicle speeds of 25 mph, estimated average hourly noise levels from SGP-related traffic during the construction phase would be 48 dBA $L_{EQ}$ at 50 feet from the roadway; this would be below the impact threshold level of 55 dBA. Noise from traffic on Johnson Creek Route could change wildlife migration in Tamarack Creek drainage during the first 2 years of SGP construction. Noise from an individual vehicle would be temporary; however, between 5:00 am and 7:00 pm, when most vehicles would use Johnson Creek Route, there would be approximately five mine-related vehicles per hour. Estimated average hourly noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA $L_{EQ}$. This would be below the threshold of 55 dBA. Noise and the number of vehicles on Burntlog Route could change wildlife distribution in Big Chief drainage. Less mine-related traffic and the proximity of Burntlog Route to the FCRNRW could indirectly increase recreation use of the area. Constructing Burntlog Route close to the ridge on the FCRNRW boundary could increase dispersed recreation use, both in areas adjacent to the FCRNRW and within Big Chief Creek drainage within the FCRNRW. If recreation use in the FCRNRW increases, the duration, and extent where wildlife distribution changes, either from vehicles or increased human activity, could increase. The extent where big game and sensitive wildlife species habitats within the FCRNRW are avoided by wildlife could increase. Traffic and plowing on Stibnite Road from the village of Yellow Pine to the SGP, when audible, could change wildlife distribution in Tamarack Creek drainage. The natural quality of wilderness character could decrease within the Big Chief Creek drainage. Sound from mine traffic during the mine closure and reclamation also would be audible within the FCRNRW; however, with fewer mine vehicles using Burntlog Route, the daily duration of traffic sound could be less than during operation. Topography, weather, and natural sounds influence the distance noise can be heard.

Noise from the daily Burntlog Route maintenance could disturb wildlife and change their natural distribution. The extent of wildlife distribution changes is influenced by wildlife species sensitivity to noise, number of vehicles, and duration of human activity. Burntlog Route, which would be open to public use when other routes into the area are not available, could increase disturbance to wildlife species as the public could use the road at any time of day. Individuals in wildlife populations could become habituated to Burntlog Route noise and traffic during the 15 years of operation and 5 years of mine
closure and reclamation. In the long-term, vehicles on Burntlog Route would likely change the
distribution of species in the FCRNRW.

During the 2 years of Burntlog Route decommissioning and reclamation after mine closure, noise and
human activity could disturb big game and sensitive wildlife species within the FCRNRW. Untrammelled
above, noise from these activities noise would attenuate to 55 dBA approximately 0.28 mile from the
activity (Forest Service 2022d). Recontouring slopes, spreading growth media, and seeding areas would
be conducted in May through November. Noise impacts from decommissioning Burntlog Route would
last for a few weeks while decommissioning activities are conducted in a specific location. Once human
activity and noise from decommissioning cease, habitat use in the FCRNRW by big game and
disturbance-sensitive wildlife would return over time to natural distributions.

The extent within the FCRNRW where wildlife could be disturbed or areas where wildlife would avoid is
unknown. Lights from mine operation and vehicle lights on Burntlog Route could be visible within the
upper elevations of Big Chief Creek within the FCRNRW. Noise and lights could disturb sensitive
wildlife species. However, over time, some individuals could become habituated to noise, lights, and
human activity. The natural quality of wilderness character would be impacted where wildlife distribution
changes within the FCRNRW.

A new transmission line would be constructed from the new Johnson Creek substation to the SGP.
Raptors could use the new line structures as perches, which can expose them to electrocution risks
(Eccleston and Harness 2018). Raptor species with home ranges that include portions of the FCRNRW, or
recommended wilderness areas could perch and forage from transmission line structures. There could be
raptor mortality from electrocution or collisions with transmission line structures, indirectly reducing the
number of raptors in the FCRNRW or recommended wilderness areas. As part of the SGP, the
transmission line structures would be designed and constructed to meet the APLIC recommended raptor-
protection recommendations (Section 2.4.9) to reduce the potential for electrocution and to limit raptor
perching. Power structures designed with APLIC recommended raptor-protection would reduce the risk
of raptor mortality. The natural quality of wilderness character would be impacted if there was a decline
in raptor populations from mortality caused by the transmission line, although this is not anticipated from
the SGP.

*Air and Water*

The SGP would result in emissions that could affect air quality in the FCRNRW. The predicted emissions
of pollutants from within the Operations Area Boundary into the FCRNRW, as discussed in Section 4.3
and the SGP Air Quality Specialist Report (Forest Service 2022a), including ozone precursors (e.g.,
nitrogen oxides and volatile organic compounds) would be below the NAAQS thresholds. The potential
deposition of nitrogen, mercury, and sulfur in the FCRNRW also were predicted to be below analysis
thresholds outside the Operations Area Boundary.

The predicted regional haze from SGP operations to a distance outside the Operations Area Boundary of
31 miles, which includes portions of the FCRNRW, would be less than a 5 percent change in current
conditions. Visibility of the landscape within the FCRNRW within 31 miles of the Operations Area
Boundary would not be impaired.
Plumes from emissions sources during mine operation could be visible within the FCRNRW; however, when and where the plume is visible depends on topography, weather conditions, and time of day. The SGP emission sources would be in a valley, and the intervening topography would influence the plume’s visibility within the FCRNRW. In the long-term, the natural quality of wilderness character within the FCRNRW would be impacted where and when plumes from emissions are visible likely to negligible to minor levels.

The mining and hauling of limestone and operation of the lime generation plant would increase air emissions in the analysis area. Emissions from the on-site generation of lime and the increased number of propane deliveries could increase sulfur dioxide emissions. However, emissions would be below NAAQS thresholds. SGP impacts to air quality, including haze and plumes, would be long-term and negligible to minor.

The potential exists for increased runoff, erosion, and sedimentation from vegetation removal and surface disturbance, which could result in increased sediment load in streams. SGP facilities would be constructed and operated in watersheds that do not contain tributaries that enter the FCRNRW. Widening approximately 1.3 miles of Meadow Creek Lookout Road (FR 51290) for construction of the Burntlog Route would remove vegetation and disturb soils within 170-300 feet from the FCRNRW boundary. Where vegetation would be removed, and surface disturbance is upgradient to the FCRNRW boundary, sediment could be deposited into headwater tributaries to Big Chief Creek. Sediment deposition in streams within 300 feet of Burntlog Route could increase relative to existing conditions (Watson 2000). Stormwater pollution protection measures and interim reclamation would reduce the potential for sediment deposition into Big Chief Creek tributaries within the FCRNRW. Interim reclamation would establish vegetation cover indirectly reducing erosion. In the short-term, the natural quality of wilderness character within the FCRNRW could be impacted if SGP activities along Burntlog Route resulted in increased sediment deposition in the headwater tributaries. The 5.3 miles of Burntlog Route in the Riordan Creek drainage would be located within 100 feet of the FCRNRW boundary. Although this road segment would be close to the wilderness boundary, a ridge separates it from streams in the FCRNRW. Surface water flow and sediment from this section of Burntlog Route would not deposit to headwater tributaries within the FCRNRW.

The reduction in mine traffic during operations on Burntlog Route to 50 vehicles per day on average could reduce the amount of dust generated; however, there could be an increase in vehicles from public recreation. Dust abatement mitigation measures on Burntlog Route would decrease the generation of fugitive dust from vehicles, although some dust deposition could occur on plants within the FCRNRW.

**Ecological Processes**

Widening approximately 21 miles of existing roads (Meadow Creek Lookout Road [FR 51290], Thunder Mountain Road [FR 50375], and Burnt Log Road [FR 447]) could indirectly increase recreation use within the FCRNRW as a result of improved access. The connection of Burntlog Route to Meadow Creek Lookout Road (FR 51290) could indirectly increase recreation use and duration of recreation activities within areas of the FCRNRW accessed from these roads. If recreation use increased, people and pack animals could compact soils, indirectly increasing erosion potential on portions of trails within the
FCRNRW. The intensity of the effect on ecological processes from increased recreation use within the FCRNRW is influenced by site conditions, vegetation, and the duration of use at a specific site.

The number and size of vehicles using Burntlog Route for mine operation and closure and reclamation could result in wilderness visitors avoiding areas of the FCRNRW and this avoidance could indirectly increase recreation use in recommended wilderness areas or other areas of the FCRNRW, such as Big Creek. The increase in recreation use could result in areas where human influence impedes the free play of natural forces or interferes with natural processes in localized areas of the FCRNRW and recommended wilderness areas. Depending upon the magnitude, there could be long-term local changes in ecological processes within the FCRNRW and recommended wilderness areas. The natural quality of wilderness character could be impacted where there are changes in ecological processes.

The public access road would be open to all vehicles year-round. Forest visitors would have motorized access to public lands beyond the SGP and adjacent to Monumental Summit from the village of Yellow Pine. Public access road use through the SGP is expected to be seasonal due to snow cover between December and May, or later in the year. During the 15 years of operation, mine-related traffic on the Burntlog Route would be 50 AADT. Recreation equipment and vehicles could disperse non-native plant species. The potential increase in recreation use under the 2021 MMP, either on Burntlog Route or the public access road through the SGP, is unknown. If recreation use in areas of the FCRNRW adjacent to the Burntlog Route increased, there could be a loss of natural ecological processes where non-native plant species become established, and wildlife is disturbed.

Undeveloped

No structures would be constructed, or SGP-related mechanical transport used, within the FCRNRW or recommended wilderness areas. Changes in Valley County road maintenance or groomed OSV routes would not include roads or routes within or adjacent to recommended wilderness areas. The construction, operation, and closure and reclamation of SGP facilities would not change existing infrastructure within the FCRNRW or recommended wilderness areas. The undeveloped quality of wilderness character would remain unchanged relative to existing conditions within the FCRNRW and the recommended wilderness areas.

Solitude, Remoteness, and Primitive Recreation Opportunities

The opportunities for solitude, remoteness, and primitive recreation within the FCRNRW and recommended wilderness areas could be indirectly affected by mining facilities and access roads outside of the FCRNRW and changes in wilderness visitation. Weather, topography, and vegetation influence the distance sounds would be audible and lights visible within the FCRNRW.

The public access road through the SGP and construction of the Burntlog Route could increase recreation use within the FCRNRW. During the 15 years of operation, the public access road usage is expected to be seasonal because the destination areas for the public are generally inaccessible between December and May due to snow cover, with some areas such as Monumental Summit not accessible until June or early July. Forest visitors would have motorized access to public lands beyond the SGP and adjacent to Monumental Summit from the village of Yellow Pine. The public access road could increase the number of wilderness visitors by providing another access route. Forest visitors seeking solitude in Monumental
Creek and Big Chief Creek may need to venture farther into the FCRNRW. The location of the Burntlog Route close to the FCRNRW boundary could indirectly increase recreation use. Because the distance between the Burntlog Route within the Riordan Creek drainage and the wilderness boundary would be minimal, there would be an increase in the areas where the sounds and lights would be audible or visible within the FCRNRW. Increases in recreation use and areas where noise and lights from human activity would be audible or visible would reduce the area with opportunities for solitude, remoteness, and primitive recreation. Traffic and plowing on Stibnite Road from the village of Yellow Pine to the SGP, when audible, would reduce opportunities for solitude in Tamarack Creek drainage. During construction, operations, and closure and reclamation there would be less area within the FCRNRW or recommended wilderness areas where solitude, remoteness, and primitive recreation opportunities quality of wilderness character would be available. These impacts would be long term, negligible to moderate, and localized.

Noise from mine related vehicles on the Johnson Creek Route during construction could decrease remoteness and increase the evidence of humans in Tamarack Creek drainage adjacent to the road. The Burntlog Route would decrease remoteness and increase the evidence of humans within Big Chief Creek drainage during construction, operation, and closure and reclamation. Burntlog Route cut and fill slopes, repeater site access roads, and mine operation lighting could be visible to wilderness visitors within Big Chief drainage, Summit trail, and at higher elevations within the FCRNRW. Sounds from the construction, operation, and daily maintenance of Burntlog Route also could be audible in these areas. As the visitor ventures farther into the FCRNRW, the effects on solitude, remoteness, and primitive recreation opportunities could lessen. Where visible, cut and fill slopes and changes in vegetation structure could detract from the wilderness visitors experience within close proximity to the FCRNRW boundary.

During decommissioning and reclamation of the Burntlog Route, the duration of sound from recontouring slopes and seeding areas would be temporary, as activities would be completed within a few days or weeks at any given location. While the cut and fill slopes would be seeded during reclamation, the change in vegetation structure could be visible from areas within the FCRNRW for decades. The duration would be greatest in areas where cut slopes remain after decommissioning Burntlog Route or where trees are removed during construction.

The Burntlog Route would change motorized access to several trailheads/trails leading into the FCRNRW. Indirectly, the Burntlog Route could increase the number of wilderness visitors and the duration of recreation in the FCRNRW. The potential for recreation use to increase is unknown; however, once constructed, the public could use Burntlog Route for approximately 20 years. Visitor encounters at trailheads/trails within the analysis area of the FCRNRW wilderness could increase due to the widening of Burnt Log Road (FR 447) and Meadow Creek Lookout Road (FR 51290) as part of the Burntlog Route.

The number and size of vehicles transporting supplies to the SGP on the Johnson Creek Road and the Burntlog Route could deter some visitors from the FCRNRW. The number of vehicles and delays due to construction and maintenance activities could indirectly increase recreation use in recommended wilderness areas or other areas of the FCRNRW. During construction, operations, and closure and reclamation, wilderness visitors would need to travel farther into the FCRNRW or recommended wilderness areas to attain solitude, remoteness, and primitive recreation opportunities.
Wild and Scenic Rivers

The following activities under the 2021 MMP have the potential to intersect with eligible or suitable WSRs, as discussed in the sections below.

During construction, operation, and closure and reclamation, mine-related traffic would access the SGP from SH 55, north of the town of Cascade, via Warm Lake Road (CR 10-579). This route crosses the SFSR.

During construction, access to the SGP from Warm Lake Road would be via Johnson Creek Road (CR 10-413) to the village of Yellow Pine, and from Yellow Pine to the SGP via the Stibnite Road portion of McCall-Stibnite Road (CR 50-412) (i.e., the Johnson Creek Route) until the Burntlog Route is complete. The Johnson Creek Road has multiple crossings of Johnson Creek. During operations and closure/reclamation, mine-related traffic would use the Burntlog Route.

Burnt Log Road (FR 447) crosses the WSR-eligible Burntlog Creek and its tributaries. The road would change from a summer-only route with primarily recreational traffic to year-round use involving plowing, de-icing, and serving heavy industrial vehicles. During mine operations, these borrow (quarry) sites would be used to stockpile soil/cleared vegetation for use in eventual reclamation. Mine closure and reclamation traffic would continue to use the Burntlog Route during these activities, and the new road segments would be decommissioned at completion of closure and reclamation activities. Any additional access to the SGP post-closure would be via the Johnson Creek Road or other existing routes.

Construction activities at existing substations, the construction of new substations, the upgrading of an existing transmission line along the WSR-eligible segment of Johnson Creek, and the construction of a new transmission line between a new Johnson Creek substation and a SGP substation. The transmission line ROW would be widened to 100 feet from 70 feet, and vegetation would be cleared and maintained in this area as needed. The upgraded transmission line also would cross the eligible SFSR at Warm Lake Road.

The Burntlog Maintenance Facility would be located along Burnt Log. This location is near Peanut Creek in the Burntlog Creek watershed. The Burntlog Maintenance Facility would be located in part of a new borrow site that would be excavated for gravel for the Burntlog Route road improvements. Following excavation, the maintenance facility would serve as a base for equipment and materials stockpiles needed for winter plowing and sanding of the Burntlog Route.

Construction

Burntlog Creek

Free-flowing conditions of eligible, suitable, and designated WSRs

Construction activities would result in short-term, negligible, and localized impacts to the free-flowing condition as a result of culvert and bridge replacement on Burnt Log Road under the 2021 MMP. There would be no impact to the free-flowing characteristics of Burntlog Creek.
Water quality of eligible, suitable, and designated WSRs

The 2021 MMP includes widening and resurfacing Burnt Log Road through the Burntlog Creek watershed (approximately 13.75 miles of roadway). Widening would entail the excavation (or blasting) of uphill cut slopes and construction of downhill fill slopes. Three bridges would be replaced within the watershed, at Burntlog Creek, East Fork Burntlog Creek, and a tributary to East Fork Burntlog Creek. Remaining stream and drainage crossings would be via culverts. Because the roadway would be widened, existing culverts would be removed and replaced.

Up to three borrow sources in the Burntlog watershed have been identified, two for rock to be used during road construction, and one for sand to be used for road maintenance during operations. The Motorized Mixed-Use Analysis Report (DJ&A, PC 2017) anticipates an addition of 65 vehicles per day on the Burntlog Route during construction, with 69 percent of those anticipated to be heavy vehicles.

The addition of the Burntlog Maintenance Facility would likely have an incremental increased effect on stormwater runoff, potential leaks or spills of automotive fluids, and sedimentation of dust from on-site road sanding material storage and vehicle travel over gravel surfaces. However, the facility would change less than 0.1 percent of the watershed to industrial use from forestry use, so any effects on water quality, ORVs, or the Wild classification of Burntlog Creek are likely to be negligible.

During Burntlog Route construction, the potential also exists for increased runoff, erosion, and sedimentation as a result of localized vegetation removal and excavation of soil, rock, and sediment, which could result in increased sediment load in streams. Expected permit stipulations from the IDWR and IDEQ would require that: streambank vegetation be protected except where its removal is necessary; new cut or fill slopes not protected with some form of riprap be seeded and planted with native vegetation to prevent erosion; use of temporary erosion and sediment control BMPs associated with a SWPPP; and all construction activities be conducted per Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations.

ORVs for which eligible, suitable, and designated WSRs are recognized

During construction, replacement of culverts at stream crossings along the Burnt Log Road has the potential to temporarily impact fish passage, increase sedimentation, and alter primary productivity. Use of typical BMPs during installation of stream crossing structures, would minimize the potential for temporary effects to fish passage if used during periods of the year when passage is most critical (e.g., spawning periods for salmon and juvenile outmigration). With implementation of required BMPs, impacts would be temporary, negligible, and localized.

Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs

Figure 4.23-1 shows the noise and visual impacts of the 2021 MMP along the Burntlog Route. Roadway widening would be generally consistent with the VQO of Preservation (Wild segment) and Partial Retention (Recreational segment).
These impacts are likely to be most pronounced during construction of the route. During widening of the road, noise levels would attenuate to the threshold of 55 dBA approximately 0.57 mile from the source of activity based on distance alone. Accounting for ground absorption and atmospheric absorption, noise from access road construction would attenuate to 55 dBA approximately 0.28 mile from the source of activity. Road construction and associated noise would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.) and roadway construction noise would dominate the noise environment within about 2,000 feet of the road. Downstream of the Burntlog Route, Burntlog Creek has a preliminary classification of Wild. Noise is expected to temporarily adversely affect approximately 880 acres of the WSR corridor, and visual impacts would be noticeable from approximately 600 acres of the corridor.

The segment upstream of Burntlog Route has a preliminary classification of Recreational. Noise impacts during construction would temporarily affect approximately 720 acres in this segment and visual impacts would affect approximately 1,140 acres. As one of the potential borrow areas is located adjacent to the road crossing of Burntlog Creek and partially within the WSR corridor, recreation access to this portion of the waterway could be adversely affected.

Due to increased ROW width, approximately 28.6 acres of additional utility ROW would be located within the Wild segment of the Burntlog Creek WSR corridor at its confluence with Johnson Creek. However, at this location the existing utility corridor and transmission line are not visible from Burntlog Creek itself (Forest Service 2013b) and changes to it would not affect the preliminary classification of Wild.

**Johnson Creek**

**Free-flowing conditions of eligible, suitable, and designated WSRs**

Construction activities would not impact the free-flowing condition of Johnson Creek, as there would be no impoundment, diversion, or other water resource projects within this waterbody as a result of the 2021 MMP. There would be no impact to the free-flowing characteristics of Johnson Creek.

**Water quality of eligible, suitable, and designated WSRs**

The transmission line corridor parallels the eligible Recreational segment of Johnson Creek. The existing ROW would increase from 70 to 100. If additional vegetation such as trees require clearing for construction or transmission line safety, this could result in an adverse impact to water quality from vegetation clearance. Decreased shade can increase water temperatures in the creek, and reduced vegetation cover can increase sedimentation rates. Upgrade of the transmission line would include new spur roads that also could increase sediment runoff. Vehicle use on spur roads or along the ROW corridor could result in potential impacts from oil or gas spills. During construction, sedimentation from construction sites could increase in the short term. Expected permit stipulations from IDWR and IDEQ would require the use of erosion and sediment control BMPs associated with a SWPPP (Forest Service 2022f and Section 4.9). All activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations. ROW clearing would be for the purpose of maintaining low height vegetation during operations and would not entail clearing and grubbing to bare soil. Consequently, the vegetation root structure within soils would be retained, reducing erosion potential compared to bare soil. With implementation of required BMPs,
Figure 4.23-1
Visual and Noise Impacts to Wilderness from Burntlog Road Stibnite Gold Project
Stibnite, ID


LEGEND

Project Components*
- Burntlog Route
- Burntlog Route Barrow Source
- Upgraded Transmission Line
- Perpetua Offsite Facilities
- Wilderness Analysis
- Burtnlog WSR Corridor Visual Impacts
- Burtnlog WSR Corridor Noise Impacts
- Burtnlog Creek WSR Corridors

Impacts to Wilderness
- Burntlog Road New Construction/Operation/Reclamation Noise Impacts (1 Mile)

Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Highway
- Road
- Stream/River
- Lake/Reservoir

*Project Components are associated with Burntlog Road.

Note: The McColl – Stibnite Road (CR 50-412) consists of Lick Creek Road, East Fork South Fork Salmon River Road (East Fork Road), and Stibnite Road.
impacts to water quality would be short term, negligible to minor, and localized during construction and
long term, negligible to minor and localized during operations and closure and reclamation.

**ORVs for which eligible, suitable, and designated WSRs are recognized**

The existing transmission line parallels Johnson Creek and its ROW overlaps with the creek and WSR study corridor. Accessing the existing transmission line for upgrades and maintenance would require truck traffic that could damage heritage resources along the transmission line upgrade route. However, avoidance of historic properties (i.e., National Register eligible heritage resources) would be implemented, or mitigation required prior to construction activities (Forest Service 2022l and Section 4.17). The transmission line itself is an eligible historic property and part of the heritage ORV of this segment of river, however, maintenance and upgrade of the transmission line are part of the nature of the infrastructure and therefore would not be considered an adverse effect to the historic property.

During construction, mine-related traffic would access the SGP using Johnson Creek Road (CR 10-413). Because no roadwork would occur outside of the existing ROW, no physical impacts to heritage resources (artifacts or sites) would occur. Increased mine traffic on Johnson Creek Road next to the eligible segment could have noise and visual impacts to the area, although this would not physically impact heritage resources. Impacts to heritage resources would be negligible to major (if a historic property cannot be avoided by construction), localized, and long-term (Forest Service 2022l and Section 4.17).

Short-term indirect effects to the recreation setting could result from increased traffic related to mine construction (approximately 65 AADT during construction). These impacts would be short term (approximately 3 years), as mine-related traffic under the 2021 MMP would be diverted to the Burntlog Route during operations and closure/reclamation.

**Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs**

During construction, traffic noise levels along Johnson Creek would rise by 2 dBA day-night noise level (Forest Service 2022d). On average this increase is not detectable, and so would not likely adversely impact the Recreational designation of Johnson Creek. Recreation access would not be impacted under long-term operational conditions.

**South Fork Salmon River**

**Free-flowing conditions of eligible, suitable, and designated WSRs**

Construction activities would not impact the free-flowing condition of the SFSR as a result of the 2021 MMP. There would be no impact to the free-flowing characteristics of the SFSR.

**Water quality of eligible, suitable, and designated WSRs**

The transmission line corridor crosses the eligible SFSR at Warm Lake Road. Widening the ROW from 70 to 100 feet would increase the ROW by 17.4 acres within the SFSR WSR study corridor. Although some loss of shading or temporary sediment increases during vegetation clearance or line construction would occur, any effects to water quality would likely be too small to measure because of this waterway’s large watershed and large flow volume. As discussed in the SGP Surface Water and Groundwater Quality Specialist Report and Section 4.9 (Forest Service 2022f), expected permit stipulations from the IDWR
and IDEQ would ensure that streambank vegetation would be protected except where its removal is absolutely necessary; use of temporary erosion and sediment control BMPs associated with a SWPPP; and that all activities would be conducted in accordance with Idaho environmental anti-degradation policies, including IDEQ water quality regulations and applicable federal regulations. With implementation of required BMPs, impacts to water quality would be short term, negligible to minor, and localized during construction and long term, negligible to minor, and localized during operations and closure and reclamation.

**ORVs for which eligible, suitable, and designated WSRs are recognized**

During construction, temporary, negligible to minor, and localized impacts would occur to recreation ORVs for the SFSR through temporary impacts to recreational access by construction-related access restrictions; or access delay, noise, or visual impacts in the vicinity of the existing transmission line crossing.

Recreation access would be restored following transmission line construction, and, therefore, no long-term impacts to recreation ORVs are anticipated.

Construction activities related to vegetation clearing in the transmission line ROW and replacement of conductors and support structures would cause short-term, negligible to minor, and localized impacts to scenery ORVs (Forest Service 2022p). Long-term impacts to scenery ORVs at the crossing could result from vegetation clearing within the expanded ROW and the larger, taller utility poles. Direct impacts would be of limited geographic extent and associated with the existing disturbance of the crossing of Warm Lake Road over the SFSR. Therefore, long-term direct impacts to scenery ORVs would be minor. There would be no construction impacts to geological, cultural, botanical, and fisheries ORVs.

**Impacts to the Wild, Scenic, or Recreational classification for eligible and suitable WSRs**

Construction activities could briefly limit recreational access to the Recreational SFSR during widening of the transmission line ROW where it crosses the river at Warm Lake Road. Impacts would be temporary, negligible to minor, and localized and would not affect the Recreational classification.

**Operations**

As described below, activities at the SGP during the operations phase would not directly or indirectly affect eligible or suitable WSR segments on the SFSR, Burntlog Creek, or Johnson Creek. Under the 2021 MMP, the Burntlog Maintenance Facility would be located along Burnt Log Road (FR 447) approximately 4.4 miles east of the junction of Johnson Creek Road (CR 10-413) and Warm Lake Road (CR 10-579) and would house road maintenance and snow removal equipment.

Upon completion of the Burntlog Route, all mine-related operational traffic would use that route. The nexus of access roads to eligible and suitable WSR segments is all mine access routes cross the suitable segment of the SFSR on Warm Lake Road and Burnt Log Road crosses the eligible segment of Burntlog Creek and divides the upper Recreational portion from the lower Wild portion.
**Burntlog Creek**

**Free-flowing conditions of eligible, suitable, and designated WSRs**

Impacts to free-flowing conditions of Burntlog Creek would continue due to the presence of culverts and bridge crossings along the Burntlog Route. Stream crossings would be designed to minimize potential impacts on surface water hydrology, water quality, and fish passage. Perpetua would be required to comply with specific design requirements as part of the IDWR Stream Channel Alteration Permit. Permit-related design requirements, use of BMPs, and required maintenance activities would allow natural streamflow and minimize impacts to free-flowing condition. There would be no impact to free-flowing conditions of Burntlog Creek during operations.

**Water quality of eligible, suitable, and designated WSRs**

Burnt Log Road would be widened and mine-related traffic on it would increase. Approximately 70 acres of the Burntlog Creek watershed would be affected by road widening cut and fill activities. Approximately 10 of those acres would be within the eligible WSR corridor. The road would be plowed and sanded during winter months (currently it is not plowed or sanded). The road would be re-surfaced with sub-base material topped by gravel. The culvert at the Burntlog Creek crossing would be replaced. A borrow pit (gravel extraction) would be within the eligible WSR corridor, on the east side of the current road crossing of Burntlog Creek (Figure 4.23-1).

As described above under Construction, increased acreage of gravel roads and increased heavy vehicle traffic is associated with increases in sediment load delivery to streams (Reid and Dunne 1984). Forest roads can accelerate erosion and sediment delivery to streams and have been identified as the primary contributor of sediments to stream channels in managed watersheds (Trombulak and Frissell 2000). Roads are often chronic sources of sediment delivery from cut-slopes, ditch-lines, and running (i.e., driving) surfaces, and act as potential sites for accelerated mass movements (e.g., mud slides). Roads also intercept subsurface flows, concentrate flows in ditch lines and through culverts and bridges, and act as direct conduits for sediment delivery to stream channels (Beschta 1978).

For operation and use of the Burntlog Route, standard erosion control measures, such as silt fencing, ditch checks, and other measures, would be installed and maintained to minimize the potential for erosion and sedimentation. Numerous small (15- to 60-inch) drainage culverts would be installed along the Burntlog Route to reduce rutting and shunt water out of ditches and off the road prism. The road would be maintained as a hardened road surface with gravel surfacing to allow for all-weather use of the road. Impacts would be long term, minor, and localized.

**ORVs for which eligible, suitable, and designated WSRs are recognized**

Burntlog Creek has an ORV for fish. If year-round heavy vehicle use and winter plowing/sanding of the Burntlog Route during mine operations increases sedimentation rates to Burntlog Creek, this could adversely affect fish spawning habitat in the creek. The SGP may cause changes in fish habitat in the analysis area that may affect aquatic species, including federally listed fish species and aquatic habitat and Management Indicator Species downstream of the SGP area. The SGP may affect fish species by degrading water quality in waterways adjacent to access roads. Fish populations may be impacted through the establishment of fish access upstream of the Yellow Pine pit and fish health may be impacted if any
hazardous material spills occur at the SGP or along the access roads (Forest Service 2022i) and are not immediately contained.

**Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs**

Noise levels during mine operations along the Burntlog Route from road maintenance and use would increase by about 10-12 dBA (at about 2,000 feet distance from the road) and would be particularly noticeable in winter due to plowing and winter traffic, which does not currently occur. Noise impacts could adversely impact the overall wild character of the eligible Wild segment of Burntlog Creek.

The 2021 MMP includes a borrow site that would be located partially within the Burntlog Creek WSR corridor, at the crossing of Burnt Log Road. Sand and gravel excavated from this burrow site and other quarries would be stockpiled at the borrow site for use during winter maintenance. This may inhibit recreational access to the Recreational portion of Burntlog Creek, as the location of the quarry and stockpile site would be located at the only road access point to the Recreational section of the creek.

**Johnson Creek**

**Free-flowing conditions of eligible and suitable WSRs**

No impacts to the free-flowing conditions of Johnson Creek are anticipated during operations as no impoundments or diversions are anticipated to occur.

**Water quality of eligible, suitable, and designated WSRs**

As discussed in the Access and Transportation Specialist Report, traffic during operations on the native-surfaced/gravel Johnson Creek Road would return to non-mine related traffic as mine traffic would shift to the Burntlog Route. The road would not be plowed for winter use once the Burntlog Route was complete. Impacts to water quality in Johnson Creek during operations would be long term and negligible (Forest Service 2022f).

**ORVs for which eligible, suitable, and designated WSRs are recognized**

There would be no effect to the Heritage ORV on the eligible segment of Johnson Creek from operations, as SGP operations traffic would use the Burntlog Route.

**Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs**

Although traffic along Johnson Creek Road would potentially increase over current conditions during mine operations if vendors utilize that road rather than the Burntlog Route, this increase in traffic would not change access to the eligible corridor. Consequently, there would be no impact to the preliminary classification of Recreational for this segment of Johnson Creek.

**South Fork Salmon River**

**Free-flowing conditions of eligible, suitable, and designated WSRs**

No impacts to the free-flowing conditions of the SFSR are anticipated during operations as no impoundments or diversions would occur.
Water quality of eligible, suitable, and designated WSRs
No impacts to water quality in the suitable SFSR would occur from implementation of the 2021 MMP, as no SGP activities are likely to cause such impacts in this location.

ORVs for which eligible, suitable, and designated WSRs are recognized.
No access road upgrades are proposed for Warm Lake Road (where it crosses the SFSR); therefore, no impacts to ORVs for which the SFSR is recognized would result from this component of the 2021 MMP.

Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs.
Recreational classification is compatible with roadway access to or along Recreational WSR waterways. The 2021 MMP would not alter access to the suitable segment of the SFSR, so there would be no impacts to its preliminary classification of Recreation.

Closure and Reclamation
Closure activities at the SGP would have the same effects to the SFSR, Johnson Creek, and Burntlog Creek as activities during operations therefore are not discussed further.

Inventoried Roadless Areas
Construction, operation, and closure and reclamation of the SGP could affect the wilderness attributes of naturalness; undeveloped character; outstanding opportunities for solitude and primitive types of recreation. A detailed evaluation of the impacts of SGP activities on roadless area characteristics by phase is included in the SGP Effects on Roadless Character (AECOM 2020j) report. Following is a summary of the analysis.

Table 4.23-1 identifies the direct impacts to IRAs that would occur under the 2021 MMP and Figure 4.23-2 shows the location of the 2021 MMP components within the IRAs in the analysis area.

<table>
<thead>
<tr>
<th>IRA Name/ (Total IRA Acreage)</th>
<th>SGP Component</th>
<th>2021 MMP Acres/(Miles)</th>
<th>Johnson Creek Route Alternative Acres/(Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard (20,891)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Black Lake (5,335)</td>
<td>Access roads</td>
<td>80.9 / (7.2)</td>
<td>0</td>
</tr>
<tr>
<td>Burnt Log (23,699)</td>
<td>Access roads</td>
<td>39.1 / (1.5)</td>
<td>0</td>
</tr>
<tr>
<td>Caton Lake (84,530)</td>
<td>Utilities</td>
<td>0.8 / (0)</td>
<td>0.8 / (0)</td>
</tr>
<tr>
<td>Horse Heaven (17,747)</td>
<td>Mine site (Acres only)</td>
<td>79.3</td>
<td>79.3</td>
</tr>
<tr>
<td>Horse Heaven (17,747)</td>
<td>Utilities</td>
<td>34.0 / (2.5)</td>
<td>34.0 / (2.5)</td>
</tr>
<tr>
<td>Meadow Creek (29,288)</td>
<td>Mine site (Acres only)</td>
<td>348.7</td>
<td>348.7</td>
</tr>
<tr>
<td>Meadow Creek (29,288)</td>
<td>Access Roads</td>
<td>86.1 / (5.0)</td>
<td>5.1</td>
</tr>
<tr>
<td>Meadow Creek (29,288)</td>
<td>Utilities</td>
<td>3.4 / (0.5)</td>
<td>3.4 / (0.5)</td>
</tr>
<tr>
<td>Needles (161,173)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Peace Rock (191,734)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Table 4.23-1

<table>
<thead>
<tr>
<th>IRA Name/ (Total IRA Acreage)</th>
<th>SGP Component</th>
<th>2021 MMP Acres/(Miles)</th>
<th>Johnson Creek Route Alternative Acres/(Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reeves Creek (10,542)</td>
<td>Utilities</td>
<td>1.2 / (0.1)</td>
<td>1.2 / (0.1)</td>
</tr>
<tr>
<td>Secesh (248,088)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Stony Meadows (13,551)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Sugar Mountain (10,340)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Whiskey (4,970)</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>673.5 / (16.8)</td>
<td>472.5 / (3.1)</td>
</tr>
</tbody>
</table>

N/A = not applicable

**Naturalness**

The 13 IRAs and lands contiguous to unroaded areas within the analysis area contain large areas of undisturbed habitat and support diverse plant communities. Air, water, and soil quality in the IRAs also are considered high quality. As shown in Table 4.23-1, construction and operation of the SGP under the 2021 MMP would directly impact Meadow Creek, Horse Heaven, Black Lake, Burnt Log, Caton Lake, and Reeves Creek IRAs. Construction and operation of mine facilities, the Burntlog Route, and the new segment of transmission line would remove vegetation, alter topography, and modify fish and wildlife habitat within IRAs. A segment of the Burntlog Route would be in the Riordan Creek drainage, where it would cross Riordan Creek north of Black Lake, where human activity and noise from construction could disturb wildlife species that use Black Lake and the associated riparian areas along Riordan Creek.

**Plants**

Approximately 740 acres of vegetation would be removed within six IRAs. Vegetation removal and construction traffic could spread non-native plant species within IRAs during the 3 years of construction. Maintaining the new transmission line, SGP facilities, and Burntlog Route during the 15 years of mine operation would increase the opportunities for non-native plant species distribution. Areas within IRAs where non-native plant species become established would alter vegetation composition and change the natural ecological processes. Perpetua would inspect vehicles at the SGLF prior to use and survey disturbed areas and treat invasive plant species for 3 years after a disturbed area is seeded or planted. These measures would decrease the potential for non-native plant spread. Surveys and implementing treatments described in the Integrated Weed Management program for the PNF and BNF would reduce the potential for non-native plant species to spread. During the 5 years of mine closure and reclamation, recontouring slopes and seeding disturbed areas would reclaim vegetation in the impacted IRAs; however, plant communities would be less diverse relative to existing conditions.

Construction of the Burntlog Route, repeater site access roads, and the new segment of transmission line would impact and result in the fill of wetlands in Burnt Log, Black Lake, Meadow Creek, and Horse Heaven IRAs. Construction of the TSF and TSF Buttress at the SGP would permanently affect slope and valley wetlands in the Meadow Creek drainage, including wetlands and riparian vegetation within the Meadow Creek IRA.
Figure 4.23-2  
Project Components and Inventoried Roadless Areas  
Stibnite Gold Project  
Stibnite, ID

Base Layer: USFS Shaded Relief Service  
Other Data Sources: Perpetua; State of Idaho Geospatial Gateway (INSIDE Idaho); USGS; Boise National Forest; Payette National Forest

LEGEND
Project Components *
- SGP Features
  - Burnt Log Route
  - Burnt Log Route Borrow Source
  - Stibnite Offsite Facilities
Utilities
- New Substation
- Existing Substation
- Upgraded Transmission Line
- New Transmission Line
RoadlessAreas
- Black Lake
- Burnt Log
- Caton Lake
- Horse Heaven
- Meadow Creek
- Needles
- Reeves Creek
- Secesh
- Stony Meadows
- Sugar Mountain
- Whiskey
- Contiguous Unroaded Lands
Other Features
- U.S. Forest Service
- Wilderness
- County
- City/Town
- Monumental Summit
- Road
- Trails
- Stream/River
- Lake/Reservoir

1 inch = 2.7 miles when printed at 11x17
During the 15 years of operation under the 2021 MMP, with the limestone processing at the SGP, the number of mine vehicles on Burntlog Route would be 50 AADT. Reducing the amount of mine related traffic could reduce the transport of non-native plant species within the Burnt Log, Black Lake, and the eastern part of Meadow Creek IRAs. Maintaining vegetation in the new transmission line segment and use of access roads would permanently change plant succession within the Horse Heaven and Meadow Creek IRAs. Vehicles used to maintain the transmission line could transport non-native plant species.

**Fish and Wildlife**

Diverting Meadow Creek into a channel and construction of a TSF embankment would reduce aquatic habitat complexity and aquatic habitat connectivity within Horse Heaven and Meadow Creek IRAs. A 5.3-mile segment of Burntlog Route would be near the ridge between the upper elevations of Riordan Creek and the FCRNRW. Human activity and noise during construction and operations could disturb wildlife species near Black Lake and the associated riparian areas along Riordan Creek. Maintaining vegetation in the new segment of transmission line and use of access roads would permanently change wildlife within small portions of the Horse Heaven and Meadow Creek IRAs.

The approximately 0.8-mile East Fork SFSR tunnel with fish passage could remove a barrier to fish passage and improve aquatic species habitat connectivity. Increases in fish habitat connectivity in the East Fork SFSR stream segments above Yellow Pine pit could improve fish species distribution in Sugar Creek drainage. The extent and intensity of the increase would vary depending on fish species and other water quality parameters. In the long-term, if aquatic habitat connectivity increased, the natural quality of roadless character could improve in the Sugar Mountain IRA.

During construction, operation, and closure and reclamation of access roads, vegetation removal and excavation of soil and rock could increase sediment load in sections of streams within Sugar Creek, Burnt Log, Black Lake, Meadow Creek, and Horse Heaven IRAs. Fish habitat connectivity would be temporarily disrupted during the installation or removal of culverts on access roads within these five IRAs. Erosion control measures, such as sediment fencing, ditch checks, and other measures, would reduce erosion from the road into streams.

Vegetation including habitat for Canada lynx and wolverine removed within the Meadow Creek, Horse Heaven, Black Lake, and Burnt Log IRAs would alter wildlife habitat by reducing cover and changing habitat quality. The lack of vegetation cover in addition to the newly constructed retaining walls for access roads could change wildlife movement and distribution (Montgomery et al. 2012). During mine operation, vegetation would continue to be removed as the TSF facility is expanded. A 6-foot-tall wildlife fence would surround the TSF. Creation of the TSF and TSF Buttress would remove wildlife habitat and could change wildlife species distribution in the Meadow Creek and Horse Heaven IRAs. The SGP Wildlife and Wildlife Habitat Specialist Report (Forest Service 2022j) provides additional information.
Construction and operations noise, lights, and human activity could displace wildlife species from habitat within IRAs and lands contiguous to unroaded areas during the 3 years of construction. Some wildlife species could temporarily avoid habitat if noise from construction activities is greater than ambient levels (Robinson et al. 2010; Trombulak and Frissell 2000). As described in the Noise Specialist Report, SGP-related noise levels are predicted from noise generated by major SGP-related noise sources. Estimated average hourly noise levels from SGP-related traffic on the Burntlog Route during the operations phase would be 49 dBA $L_{eq}$, below the threshold of 55 dBA (Forest Service 2022d and Section 4.6).

During mine closure and reclamation activities, approximately 5 years, the wildlife security fencing around the TSF and other areas would be removed. As vegetation becomes established, and human activity decreases, wildlife distribution for some species could return to existing conditions.

**Soil, Water, and Air**

Construction of SGP facilities would result in soil resource commitments and DD resources within IRAs. Interim reclamation and EDFs could reduce the potential loss of soil resources. Growth media from Burntlog Route construction would be stockpiled and stored in borrow source sites and in windrows at the top of fill slopes. Long-term storage of growth media also could reduce mycorrhizal activity and a loss of soil viability. During closure and reclamation, growth media would be spread and areas reseeded within the TSF and backfills in the Meadow Creek and Horse Heaven IRAs and along the Burntlog Route within the Meadow Creek, Burnt Log, and Black Lake IRAs. Areas with soil nail walls would be reclaimed to the foot of the wall; however, soil nail walls would remain.

During construction, approximately 2 miles of Meadow Creek would be diverted around the south side of the TSF and TSF Buttress. In the Meadow Creek and Horse Heaven IRAs, water temperature and chemistry in the 2-mile stream segment of Meadow Creek located in a channel could change and become less productive for fish and aquatic species. Changes to streamflow, groundwater-surface water interactions, and stream shading have the potential to affect stream temperatures (Forest Service 2022e and 2022i).

Fugitive dust sources during construction would include haul roads, access roads, dust from vehicle travel, and transferring material which would be deposited in adjacent areas. Dust from vehicles using unpaved roads could become airborne and there could be a temporary impact on air quality in adjacent areas of IRAs. During construction, the predicted particulate matter 2.5 microns or less and 10 microns or less emissions would be below NAAQS thresholds at the Operations Area Boundary. During operations, pollutants including ozone precursors (e.g., nitrogen oxides and volatile organic compounds) are predicted to be below NAAQS thresholds at Operations Area Boundary. The potential deposition of nitrogen, mercury, and sulfur also are predicted to be below analysis thresholds from the Operations Area Boundary outward. The lime kiln operation would increase emissions of sulfur dioxide but would remain below NAAQS thresholds (Forest Service 2022a and Section 4.3).

**Natural Appearing Landscapes with High Scenic Quality**

Construction of the TSF, TSF Buttress, access roads, and the new transmission line segment would result in new disturbance within six IRAs. During the 15 years of operation, the flatter valley basins, terraces, and slopes from the TSF and TSF Buttress would contrast with the surrounding unmodified landscapes.
within Meadow Creek and Horse Heaven IRAs. During closure and reclamation, the TSF would be graded/recontoured to blend into the surrounding topography and terrain; however, it would still be apparent in the environment. The change in elevation, flatter valley basins, terraces, and sloped landforms would continue to show evidence of human modification to natural landscapes within Meadow Creek drainage after closure and reclamation.

Areas cleared of vegetation, rock cuts, retaining walls, and human activity would be visible in Burnt Log, Black Lake, and Meadow Creek IRAs during the construction and operation of Burntlog Route. Areas cleared of vegetation, exposed soil color, and changes in terrain during the construction and operation of Burntlog Route would modify the natural landscape and reduce scenic quality. Locating a segment of the Burntlog Route within the Riordan Creek drainage would be visible in the Black Lake and Meadow Creek IRAs, depending upon the height of cut slopes. Maintaining vegetation in the new transmission line ROW and use of access roads would change plant succession within portions of the Horse Heaven and Meadow Creek IRAs for the long term. The 100-foot-wide ROW would contrast with the adjacent undisturbed vegetation, reducing the quality of scenic resources.

After decommissioning, less than one mile of soil nail walls, some slopes, and rock cuts would remain. Soil nail walls and rock cuts would continue to be evidence of human alterations in localized areas.

**Undeveloped Character**

The wilderness attribute of undeveloped character informs impacts to the roadless area characteristics of reference landscapes and natural appearing landscapes with high scenic quality. The location of the Burntlog Route would result in new surface disturbance within the Burnt Log, Black Lake and Meadow Creek IRAs. After mine closure and reclamation, the TSF and TSF Buttress would be reclaimed; however, the TSF and backfill liners, and retaining walls would remain as structures within the Meadow Creek, Horse Heaven, Black Lake, and Burnt Log IRAs. There are NFS roads and trails that allow motorized use in the roadless expanse. The SGP would result in human development, including new structures within IRAs.

**Structures**

The TSF and TSF Buttress would be permanent structures within the Meadow Creek and Horse Heaven IRAs. During mine operation, tailings deposition would change the elevation of lower Meadow Creek drainage several hundred feet amsl.

New road segments, cut and fill slopes, and soil nail retaining walls would be present along the Burntlog Route that would be within the Burnt Log, Black Lake, and Meadow Creek IRAs during construction, operations, and closure and reclamation. Indirectly, improvements to Burnt Log Road (FR 447) and the newly constructed road could increase the number of user-created dispersed recreation sites in IRAs. The proliferation of dispersed recreation sites along Burntlog Route could decrease the undeveloped roadless characteristic IRAs.

Several miles of new transmission line would be present within the Meadow Creek and Horse Heaven IRAs. Existing transmission line structures would be replaced, and new access roads to transmission structures would be present within the Reeves Creek and Caton Lake IRAs.
As a result of facilities constructed within the IRAs, there would be a conversion of acres within IRAs managed for Backcountry Restoration meeting the semi-primitive non-motorized setting to the area meeting rural and semi-primitive motorized physical setting during both the summer and winter relative to existing conditions (AECOM 2020j).

During closure and reclamation, mining facilities on and off the SGP and associated utilities would be removed (e.g., transmission line from Johnson Creek substation to the SGP), and new mine access roads (i.e., portions of Burntlog Route) would be decommissioned and reclaimed. After mine closure, areas of mine related disturbance, access road retaining walls, geotextile fabric, and potentially foundations for the transmission poles, would remain within the Meadow Creek, Horse Heaven, Black Lake, and Burnt Log IRAs.

**Natural Appearance**

In the long term, the Burntlog Route, transmission line structures, access roads, and repeater sites within IRAs would reduce the undeveloped area and natural landscape in localized areas. Noise, lighting, and human activity from construction and operation of mining facilities and access road construction and maintenance would change the natural landscape within the Burnt Log, Black Lake, Meadow Creek, Horse Heaven, Secesh, and Sugar Mountain IRAs and would be evidence of modern human presence and modifications to the natural environment.

During closure and reclamation, the TSF and TSF Buttress within the Horse Heaven and Meadow Creek IRAs would be recontoured to blend with adjacent slopes. However, the elevation and change from a V-shaped valley topography to a level valley would remain noticeable and provide evidence of past human activity. The recontoured slopes, topography, and sparser vegetation would decrease the area within IRAs with a natural appearance. Recontouring slopes, reestablishing drainage, and seeding the constructed portion of the Burntlog Route within the Black Lake, Burnt Log, and Meadow Creek IRAs could help return these areas to a natural appearance over time.

**Outstanding Opportunities for Solitude and Primitive Recreation**

The 13 IRAs and lands contiguous to unroaded areas are large enough to provide outstanding opportunities for solitude and primitive recreation. Outstanding opportunities for solitude or primitive recreation vary throughout the roadless expanse depending on topography, vegetation, distance to roads and trails that allow motorized use, and other human structures. Forest visitors seeking outstanding opportunities for solitude could be displaced from IRAs and adjacent unroaded areas during construction, operation, and closure and reclamation of the SGP. The Operations Area Boundary encompasses approximately 15 percent of the total acres within the Sugar Mountain, Horse Heaven, and Meadow Creek IRAs combined and reduces the area available for outstanding opportunities for solitude or primitive recreation. The presence of workers, vehicles, and the sound of equipment would be high during the entire life of the SGP in adjacent areas. The presence of workers, vehicles, and the sound of equipment would decrease the areas within the Meadow Creek, Black Lake, Burnt Log, and Horse Heaven IRAs and adjacent unroaded areas with outstanding opportunities for solitude and primitive types of recreation.
There would be 135,827 acres within IRAs that would meet the semi-primitive non-motorized recreation setting during the summer. During the winter, there would be 104,717 acres meeting the semi-primitive motorized recreation setting. Increasing areas within the roadless expanse meeting the semi-primitive motorized physical recreation setting could reduce opportunities for solitude and primitive recreation. Maintaining the new transmission line and use of access roads would reduce the area within the Horse Heaven and Meadow Creek IRAs with outstanding opportunities for solitude. The construction and use of the public access road through the SGP could increase recreation use and motorized access in the Meadow Creek IRA (Forest Service 2022m).

During operation, noise from daily road use or maintenance and blasting at the SGP could continue to reduce areas within these IRAs with outstanding opportunities for solitude. The Burntlog Route could lead to increased motorized public use and, thereby, indirectly increase recreation use in the Meadow Creek, Horse Heaven, Black Lake, and Burnt Log IRAs. Due to increased traffic, forest visitors also may avoid IRAs nearer to the SGP, indirectly increasing recreation use in the adjacent IRAs. After mine closure, the currently existing Burnt Log Road (FR 447) would remain and could lead to increased recreation use and decreased opportunities for primitive recreation and solitude within IRAs.

Special Features and Values

Special features in the 13 IRAs include areas valued for their scientific qualities, scenic qualities, or other notable distinct features. Special features that could be affected by the SGP under the 2021 MMP include habitat for Canada lynx, wolverine, and anadromous fish species; elk security areas (winter range) and migration paths; and vegetation communities where whitebark pine could be present. Construction of SGP facilities, access roads, and utilities could result in a loss or fragmentation of Threatened and Endangered Species and Forest Service Sensitive species habitat within the Meadow Creek, Horse Heaven, Black Lake, Burnt Log, Caton Lake, and Reeves Creek IRAs. Elk use and migration within the elk security area of the Horse Heaven IRA could be disturbed by noise from mine-related traffic and human activity during all SGP phases. Fish habitat would be improved if sediment loads are reduced and fish passage improves in streams within the Meadow Creek, Caton Lake, and Horse Heaven IRAs. Portions of the Chilcoot Peak RNA and eligible WSR segments of Burntlog Creek and Johnson Creek located within IRAs also could be indirectly affected by activities under the 2021 MMP from invasive species and sediment loading changes creating changes to water quality. Roadless area characteristics that correspond with this wilderness attribute are traditional cultural properties and sacred sites and other locally identified unique characteristics. A detailed evaluation of the impacts of SGP activities on TCPs and sacred sites is included in the SGP Tribal Rights and Interests Specialist Report (Forest Service 2022q).

Manageability

Manageability of IRAs is the ability of the Forest Service to manage these areas to maintain roadless characteristics. The new mining facilities, access routes, and the transmission line would create substantially noticeable human development and structures within IRAs and would create isolated parcels that may be difficult to manage during construction and operation of the SGP. The new transmission line segment and access roads would create an isolated parcel within the Horse Heaven IRA for the long term. The Burntlog Route within the Black Lake, Burnt Log, and Meadow Creek IRAs would create isolated
parcels that would be difficult to manage to maintain roadless characteristics during mine construction and operation. The location of the Burntlog Route and the new transmission line segment in the Black Lake, Burnt Log, and Meadow Creek IRAs would create isolated parcels that would also be difficult to manage to maintain roadless characteristics.

**Research Natural Areas**

*Table 4.23-2* describes the distance and direction of the nearest SGP component to each RNA.

<table>
<thead>
<tr>
<th>RNA</th>
<th>Location and Distance to SGP Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belvidere Creek</td>
<td>The entire Belvidere Creek RNA is within the FCRNRW and is located about 7 miles northeast of the village of Yellow Pine and approximately 6 miles north of the SGP Operations Area Boundary. Cut and fill areas associated with upgrades to the Johnson Creek Road are within 5 miles of this RNA. No impacts to this RNA from the SGP are anticipated.</td>
</tr>
<tr>
<td>Chilcoot Peak</td>
<td>Portions of the Chilcoot Peak RNA are within the FCRNRW and Burnt Log IRA and are located near FR 447 (Burnt Log Road) and the Burntlog Route.</td>
</tr>
</tbody>
</table>

*Source: AECOM 2020a*

**Construction**

As part of Burntlog Route, reconstruction of (i.e., widening, installing drainage features, etc.) approximately 3 miles of Burnt Log Road (FR 447) would remove vegetation and disturb soils located within 100 to 3,100 feet of the Chilcoot Peak RNA boundary. An approximately 2.4-mile section of Burnt Log Road that is currently within 700 to 800 feet of the Chilcoot Peak RNA boundary, would be reclaimed and decommissioned due to rerouting of the alignment. Removing existing vegetation and disturbing soils could disperse non-native invasive plant species that could become established within the Chilcoot Peak RNA (Forest Service 2019b; Jacobs et al. 2009). If the spread of plant species not currently present within the Chilcoot Peak RNA occurred, it would change research values, ecological site conditions, and ecological processes within the Chilcoot Peak RNA (Forest Service 1995). Impacts would be localized, negligible to moderate, and long term.

Once the Burntlog Route is complete, the AADT would increase from 27 to 65 vehicles, approximately 2.4 times the existing traffic volume. Increasing the number and size of vehicles using Burnt Log Road as part of Burntlog Route could increase the amount of dust deposited on adjacent vegetation. During the 2 years of the Burntlog Route construction, the effects on vegetation health from dust deposition within the RNA would likely be negligible (Squires 2016; Trombulak and Frissel 2000; Ulrichs et al. 2008).

During construction, widening Burnt Log Road would increase human activity in areas near the Chilcoot Peak RNA and could increase the potential for human-ignited fires. Fires occurring more frequently or during different seasons than lightning-ignited fires could change vegetation plant species succession and ecological processes within the Chilcoot Peak RNA. The presence of road construction crews in construction camps could have both positive and negative effects on fire conditions. Crews’ observations could decrease the amount of time before a fire is detected; however, they could also increase the
probability of a human-caused fire. In addition, design features would also limit the potential for human-caused fires during construction.

Timber harvested at the SGP could be transported on Burntlog Route. Timber from the SGP could have conifer pathogens such as pathogenic bark beetle species (e.g., mountain pine beetle \textit{[Dendroctonus ponderosae]}), and white pine blister rust, which is caused by the introduced pathogen \textit{Cronartium ribicola} (Hinke et al. 2016; Keane et al. 2017) and these pathogens could be distributed during the transport of timber on the Burntlog Route. The potential for conifer pathogens to be introduced into the Chilcoot Peak RNA depends upon site conditions during the transport of timber and specific characteristics of a conifer pathogen. Whitebark pine/subalpine fir habitat type is one of the distinguishing features of the Chilcoot Peak RNA, and conifer pathogens could cause mortality of whitebark pine and other conifers. If this occurs, changes in the composition and structure of existing vegetation communities and ecological succession would result in a localized, minor to major, long-term loss of the Chilcoot Peak RNA research value and ecological condition.

The removal of vegetation, soil disturbance, and access road improvements from the upgrade to the existing Idaho Power Company [IPCo] transmission line could disperse non-native invasive plant species into adjacent RNAs. Vehicles and equipment could transport non-native plant species seeds that could become established and spread (Trombulak and Frissell 2000). This increase in vehicles, human activity, and the disturbance of vegetation and soils would be over 3 miles from the two RNAs. Constructing the upgraded transmission line would result in negligible direct or indirect effects on the research values, ecological site conditions, and ecological processes within the two RNAs.

The application of Forest Plan standards and implementing treatments consistent with the PNF Noxious Weed Program and Idaho’s Noxious Weed Management and Control Program would reduce the potential for non-native plant species to become established within the two RNAs. Non-native invasive plant species could become established within the RNAs. This would result in a localized, negligible to minor, long-term loss of research values, ecological conditions, and ecological processes.

\textit{Operation}

During the 15 years of operation, AADT along the Burnt Log Road and newly constructed Burntlog Route would increase from 27 to 50 vehicles, approximately 1.9 times the existing number of vehicles on Burnt Log Road. Forest visitors may choose to avoid Burntlog Route and the SGP due to the increased traffic, increased number of large vehicles, and potential delays during daily Burntlog Route maintenance activities. Recreation use could increase in other areas, such as the South Fork Salmon River and Big Creek drainages. During the summer, if recreation use on Warren-Profile Gap Road (FR 50340), Hamilton Bar (FR 50673), South Fork Road (FR 50674), and NFST 291 increases, the risk of non-native invasive plant species distribution and establishment would increase (Trombulak and Frissel 2000). Non-native plant species could become established within the Chilcoot Peak RNA, although due to the design features that would be implemented, the anticipated overall impacts are expected to be negligible to minor and long-term.

Traffic on Burntlog Route could continue to deposit dust on vegetation within portions of the Chilcoot Peak RNA. Dust abatement measures during operation would reduce the amount of fugitive dust generated and the amount of dust that could be deposited on vegetation within the Chilcoot Peak RNA.
Changes in vegetation community composition and structure would result in a loss of research values, ecological site conditions, and ecological processes in the Chilcoot Peak RNA.

Changes in vegetation community composition and structure within the RNAs would occur where non-native invasive plant species become established, soils are compacted, or trails widened, or there is a change in fire frequency. Changes to vegetation community composition and structure would result in the long-term loss of research values, ecological site conditions, and ecological processes within these this RNA.

The operation and maintenance of the upgraded transmission line could disperse non-native invasive plant species. Vehicles and equipment could transport non-native plant species seeds that could become established and spread (Trombulak and Frissell 2000). The increase in vehicles, human activity, and the vegetation management of the transmission line would be over 3 miles from any RNAs. At this distance, these activities would result in negligible direct or indirect effects on the research values, ecological site conditions, and ecological processes within the two RNAs.

**Closure and Reclamation**

During mine closure and reclamation, an estimated AADT of 57 vehicles, including 27 mine vehicles, would use the Burntlog Route an additional 5 to 7 years after the mine operation ceases. During mine closure, the AADT on Burntlog Route, including 27 mine vehicles, would increase from 27 to 57, approximately 1.9 times the existing traffic on Burnt Log Road. Vehicles and daily road maintenance activities could disperse non-native invasive plant species and continue to deposit dust on vegetation within portions of the Chilcoot Peak RNA. Dust abatement measures during closure and reclamation would reduce the amount of fugitive dust generated.

Any spread of native and non-native plant species into the Chilcoot Peak RNA would change vegetation community composition and structure (Forest Service 1995). Changes in vegetation community composition and structure would result in a loss of research values, ecological conditions, and ecological processes in the Chilcoot Peak RNA. Reclamation of disturbed areas, which involve revegetation on NFS lands, would be done according to Payette or Boise Forest Plan Standards and in coordination with a Forest Service botanist. After reclamation and closure, impacts from the spread of non-native invasive plant species or changes in vegetation composition and structure would be localized, negligible, and long term.

Implementing actions described in the SGP Reclamation Plan (Tetra Tech 2021a), South Fork Salmon River Subbasin Noxious and Invasive Weed Management Plan (Forest Service 2007b), Forest Standards, the Payette and Boise National Forest Noxious Weed and Poisonous Plant Control Programs, and Valley County noxious weed control programs would reduce the potential for non-native plant species to become established within the RNAs. Implementing design features, surveys, and treatments would not altogether remove the risk of non-native invasive plants or species that are not already present in existing habitat types from becoming established and spreading into the Chilcoot Peak RNA, but it would limit the potential for this risk. Where non-native plant species become established within an RNA, there would be a localized, negligible to minor, permanent loss of RNA values.
4.23.2.3 Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the construction of mine facilities and the new transmission line would be the same as the 2021 MMP. The differences between the 2021 MMP and the Johnson Creek Route Alternative include:

- **Johnson Creek Road** – Under the Johnson Creek Route Alternative the SGP’s construction phase would be 5 years, 2 years longer than the 2021 MMP. During the construction phase, the Stibnite Road section of McCall-Stibnite Road (CR 50-412) from the village of Yellow Pine to the SGP would require daily temporary road closures from 10:00 AM to 4:00 PM, and temporary closures of Johnson Creek Road during road maintenance activities also could be necessary during the 15 years of mine operation (Parametrix 2018b). The Johnson Creek Road (CR 10-413) also could be closed for 1 year during construction (Forest Service 2022k and Section 4.16).

- **Radio repeater site construction** – Radio repeater sites in IRAs would be constructed using helicopters.

**Wilderness**

**Untrammeled**

Under the Johnson Creek Route Alternative, mine operation, off-site facilities, and the new transmission line would have the same impact on the untrammeled quality of wilderness character as those described for the 2021 MMP and are not discussed further. The Burntlog Route would not be constructed; therefore, the effects from the Burntlog Route would not exist. Because the Burntlog Route would not be constructed, the maintenance facility would be located at Landmark nearer Johnson Creek Road. The potential changes to soundscapes, natural dark skies, and natural wildlife distribution within the FCRNRW from the Johnson Creek Route Alternative operation and closure and reclamation phases would be the same as those described under the 2021 MMP. Sky glow visible within the FCRNRW during operation would be the same as the 2021 MMP.

Using the Johnson Creek Route for mine access would require improvements to Johnson Creek Road and widening/reconstructing Stibnite Road from the village of Yellow Pine to the SGP. Under the Johnson Creek Route Alternative, the number of vehicles on Stibnite Road as part of the Johnson Creek Route would increase to 102 AADT during mine construction and 87 AADT during mine operation. Traffic volumes on Stibnite Road would be approximately 2.6 times the existing AADT of 39 vehicles. Construction and road maintenance on the Johnson Creek Route could reduce the number of forest and wilderness visitors in areas of the FCRNRW where access is from Stibnite Road or Thunder Mountain Road and increase recreation use in recommended wilderness areas near these roads. After mine closure, improvements to Stibnite Road could increase recreation use in Tamarack Creek drainage of the FCRNRW if road conditions influence wilderness visitors.

The disturbance of wildlife species from dispersing into or from habitats adjacent to Johnson Creek Route could be a long-term effect. The volume of traffic during mine construction and operation could change the natural distribution of wildlife within the Tamarack Creek drainage (IDFG 2019). The extent of effects on wildlife distribution would be less because the Burntlog Route would not be constructed or used. However, the intensity of the effect on wildlife distribution within Tamarack Creek could be greater.
because there would be increased traffic for about 20 years during construction and operation. Under the Johnson Creek Route Alternative, the untrammeled quality of wilderness character could be impacted in the Tamarack Creek drainage of the FCRNRW. Impacts would be long-term, negligible to minor, and localized.

**Natural**

**Plants**

Using Johnson Creek Route as the mine access road could reduce motorized recreation use on Thunder Mountain Road and Meadow Creek Lookout Road. Delays on the public access road through the SGP and the increase in size and number of mine-related vehicles on Johnson Creek Route could decrease recreation use within the FCRNRW. Decreased recreation use could indirectly reduce the risk of non-native plant species becoming established within the FCRNRW. During mine closure and reclamation, surface disturbance from recontouring slopes, seeding and planting areas disturbed by mine facilities, and stream relocation would be 1 mile or more from the FCRNRW boundary. The distance between areas disturbed during recontouring and areas where the seed mix includes non-native annual plant species would decrease the potential for changes to vegetation communities within the FCRNRW. Reclamation of disturbed areas, which involve revegetation on NFS lands, would be done according to Payette or Boise Forest Plan Standards and in coordination with a Forest botanist. This could help retain the existing vegetation conditions within the FCRNRW. The natural quality of wilderness character within the FCRNRW could be the same as existing conditions.

However, if recreation use in recommended wilderness areas near the SFSR increases, the spread of non-native plant species also could increase. Mine related traffic on the Johnson Creek Route could result in forest visitors avoiding areas of the FCRNRW accessed from trailheads along Stibnite Road, such as Missouri Ridge. This could indirectly increase recreation use in recommended wilderness areas and other trails in the FCRNRW. Changes in recreation use could increase the potential for non-native plant species to spread into recommended wilderness areas or other areas of the FCRNRW. Surveys and implementing treatments, as described in the Integrated Weed Management program for the PNF and BNF, would reduce the potential for non-native plant species to spread. The natural quality of wilderness character within the recommended wilderness areas would be impacted if there was an increase in non-native plant species populations. Impacts would be long-term, negligible to minor, and localized.

**Fish and Wildlife**

Under the Johnson Creek Route Alternative, there could be a long-term risk to fish and aquatic habitats from the accidental spill of material, such as fuel or mine processing chemicals, where the Johnson Creek Route is adjacent to or crosses streams (e.g., Johnson Creek, East Fork SFSR). If a spill occurred and material entered a stream, there could be injury or mortality of fish and aquatic species, which could indirectly alter species distribution in portions of the FCRNRW Tamarack Creek drainage. The extent an accidental spill could affect aquatic species or fish habitat is unknown. The measures included in the SPCC Plan would reduce the extent of a spill in adjacent streams.

Using Johnson Creek Route as the mine access road could reduce motorized recreation use on Thunder Mountain Road (FR 50375) and Meadow Creek Lookout Road (FR 51290). Delays on the public access
road through the SGP and the increase in size and number of mine-related vehicles on Johnson Creek Route could decrease recreation use within the FCRNRW. Decreased recreation use could reduce the disturbance of big game and sensitive wildlife species within the Monumental Creek and Big Chief Creek drainages within the FCRNRW. During mine closure and reclamation, surface disturbance from recontouring slopes, seeding, and planting areas disturbed at the SGP would be 1 mile or more from the FCRNRW boundary. The distance from the noise generated during mine closure activities and the FCRNRW boundary would reduce disturbance to big game species and sensitive wildlife within the Big Chief Creek drainage.

The increased number of vehicles on Stibnite Road during mine construction and operation could change the natural distribution of wildlife within the Tamarack Creek drainage (IDFG 2019). The long-term effect on big game species could include reduced habitat quality and changes in the natural distribution of wildlife species within the Tamarack Creek drainage. The natural quality of wilderness character would be impacted in the areas where wildlife species change their migration patterns.

However, the volume of traffic and potential delays along Johnson Creek Route could result in forest visitors avoiding FCRNRW trailheads accessed from Stibnite Road. Indirectly, recreation use in recommended wilderness areas and other areas of the FCRNRW could increase. Changes in recreation use could increase disturbance of big game and sensitive wildlife species in recommended wilderness areas or other areas of the FCRNRW. The natural quality of wilderness character would be impacted in recommended wilderness areas where wildlife species change their migration patterns. Impacts would be long-term, negligible to minor, and localized.

Air and Water

The effects on air and water within the FCRNRW and recommended wilderness from mine construction and operation emissions would be the same as the 2021 MMP. Although the Burntlog Route would not be constructed, there would be similar construction emissions for the road improvements along the Johnson Creek Route. The rate of sediment deposition into streams within the FCRNRW and recommended wilderness areas would be the same as existing conditions. Streams crossed by the Johnson Creek Route do not flow into the FCRNRW or the recommended wilderness areas.

Ecological Processes

Using the Johnson Creek Route as the mine access road could reduce motorized recreation use on Thunder Mountain Road and Meadow Creek Lookout Road. Timing restrictions during the construction phase and road maintenance activities could deter wilderness visits to areas of the FCRNRW accessed from Monumental Creek. Decreased recreation use could reduce the potential for non-native plant species to be introduced from recreation equipment and vehicles (Rew et al. 2018). In the long-term, ecological processes within the FCRNRW would be the same as existing trends. The natural quality of wilderness character for ecological processes within the FCRNRW would be the same as existing conditions.

Indirectly, the volume and size of mine related traffic on Johnson Creek Route could indirectly increase recreation use in recommended wilderness areas. If recreation use in recommended wilderness areas increases due to forest visitors avoiding areas of the FCRNRW accessed from Johnson Creek Route, there could be an increase in the dispersal of non-native plant species. In the long-term, ecological processes
would change in areas where non-native plant species become established. The number of forest visitors who might avoid areas of the FCRNRW accessed from Johnson Creek Route is unknown. The natural quality of wilderness character would be impacted in recommended wilderness areas where non-native plant species become established.

Undeveloped

Under the Johnson Creek Route Alternative, no structures would be constructed, or SGP-related mechanical transport used within the FCRNRW or recommended wilderness areas. The undeveloped quality of wilderness character would remain unchanged relative to existing conditions within the FCRNRW and the recommended wilderness areas.

Solitude, Remoteness, and Primitive Recreation Opportunities

The 102 to 87 AADT and potential delays on Johnson Creek Route during the construction and operation phases could decrease recreation use in the FCRNRW. Public access would be allowed through the SGP under the Johnson Creek Route Alternative via a 12-foot gravel road that connects Stibnite Road to Thunder Mountain Road. During mine construction and operation, public access roads through the SGP would be temporarily closed during mining activities that are public safety hazards (e.g., high wall scaling, blasting). When the public access roads are closed due to mine operations, forest and wilderness visitors would not be able to use Thunder Mountain Road to drive to Monumental or Lookout Mountain trailheads. During mine construction, public access roads and indirectly Thunder Mountain Road could be closed for 2 to 3 months.

Helicopters used to construct and maintain cell towers or repeater sites located within IRAs could be audible in the FCRNRW. Helicopters would be used for a few hours during the day during construction and maintenance. Noise from helicopters could be audible in the Big Chief drainage and would temporarily reduce opportunities for solitude, sense of isolation, and remoteness from sights and sounds of human activities.

During the 15 years of mine operation, public access roads could be closed for periods of five days to one month. Indirectly, this could increase recreation use in other areas of the FCRNRW and recommended wilderness areas. If recreation use increases, wilderness visitors would need to travel farther into the FCRNRW or recommended wilderness areas to attain solitude, remoteness, and primitive recreation opportunities. The extent where roads adjacent to the FCRNRW boundary would be visible or audible would be the same as existing conditions. Impacts would be long-term, negligible to minor, and localized.

Wild and Scenic Rivers

Under the Johnson Creek Route Alternative, actions related to the SGP and the utility corridor would have the same effects as described under the 2021 MMP. Effects of access roads would differ for Johnson Creek, Burntlog Creek, and the Burntlog Maintenance Facility. Effects to the SFSR would be the same as described for the 2021 MMP.
**Burntlog Creek**

The Johnson Creek Route Alternative would have no direct impacts to the eligible Burntlog Creek WSR, as the access route to the mine would not utilize Burnt Log Road. No road widening, bridge and culvert replacement, slope excavation/blasting, or quarrying of sand and gravel would occur in the Burntlog Creek watershed. Under the Johnson Creek Route Alternative, the aforementioned Burntlog Maintenance Facility would be relocated and called the Landmark Maintenance Facility. The Landmark Maintenance Facility would be located where Warm Lake Road crosses Johnson Creek (upstream from the eligible Recreational segment) and would house road maintenance and snow removal equipment. The existing Burnt Log Road would not be plowed and sanded during winter and would not have dust suppressant applied during summer. Traffic on the road would remain primarily recreational and seasonal. The amount of traffic may increase over current conditions if recreationists seek alternate areas away from the SGP for their recreation activities but would likely be less than traffic projections associated with mining activity and would not include heavy industrial vehicles and equipment. The Johnson Creek Route Alternative would have no effects to water flow or quality, ORVs, or classification for Burntlog Creek.

**Johnson Creek**

Johnson Creek Road (CR 10-413) would be part of the mine access route under the Johnson Creek Route Alternative. Increased traffic would occur along this route, which parallels the eligible segment of Johnson Creek.

*Free-flowing characteristics of eligible and suitable WSRs.*

Construction activities could result in short-term impacts to the free-flowing condition of Johnson Creek as a result of culvert replacement on Johnson Creek Road. Operations-related impacts would be similar to current conditions, with free-flowing conditions modified by culverts. As described under 2021 MMP - Construction, permit-related design requirements, use of BMPs, and required maintenance activities would maintain natural streamflow and minimize impacts to free-flowing condition.

*Water quality of eligible, suitable, and designated WSRs.*

Heavy construction vehicles and equipment traffic would occur throughout construction, operation, and closure and reclamation phases. Increases in heavy vehicle traffic are associated with increases in sediment delivery load to streams (Reid and Dunne 1984). Sedimentation could adversely affect water quality and fish spawning habitat. In general, increases in sedimentation are expected from:

- Travel-generated dust and sedimentation due to the change in road use from seasonal, primarily recreational or 4x4 vehicle use, to year-round use by heavy equipment.
- Application of deicers or sand for traction during winter months.

*ORVs for which eligible, suitable, and designated WSRs are recognized.*

Johnson Creek has a Heritage ORV, primarily related to the area’s history of mining. Construction activities on the Johnson Creek Route could directly disturb historic properties (i.e., heritage resources eligible for the National Register of Historic Places) along this segment. Further, increased mine traffic on Johnson Creek Road next to the eligible segment could have noise and visual impacts to the area,
although this would not physically impact heritage resources. Impacts to heritage resources would be negligible to major (if a historic property cannot be avoided by construction), localized, and long-term (Forest Service 2022).

Preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs.

Although traffic along Johnson Creek Road would increase over current conditions during mine operations, this increase in traffic would not change access to the eligible corridor. Consequently, there would be no impact to the preliminary classification of Recreational for this segment of Johnson Creek.

Inventoried Roadless Areas

The upgrade to the transmission line would have the same effects on the roadless expanse as the 2021 MMP. A summary of the impacts under the Johnson Creek Route Alternative that would result in changes to roadless characteristics are described in the following sections.

Naturalness

Construction and operation of the SGP under the Johnson Creek Route Alternative would directly impact the Meadow Creek, Horse Heaven, Caton Lake, and Reeves Creek IRAs. Impacts to these IRAs from mine facilities and utilities would be similar in nature to the 2021 MMP. Under the Johnson Creek Route Alternative, improvements and use of only the Johnson Creek Route for mine access would eliminate impacts within the Black Lake and Burnt Log IRAs and within portions of the Meadow Creek IRA associated with the Burntlog Route.

Plants

Similar impacts to vegetation as described under the 2021 MMP would occur, but less acres within IRAs would be impacted. Construction of the Johnson Creek Route along the boundary of the Meadow Creek, Horse Heaven, and Sugar Mountain IRAs could disperse non-native invasive plant species. Construction and operations traffic along Johnson Creek Route also would increase the spread of non-native plant species into these IRAs.

Using a helicopter to construct repeater sites located within IRAs would reduce the miles of temporary access roads needed and reduce the potential for non-native plant species to spread in the eastern part of the Meadow Creek IRA.

Fish and Wildlife

Fish and aquatic species habitat alterations at the SGP would be the same as those described under the 2021 MMP. The Burntlog Route would not be constructed; therefore, the impacts from that would not exist.

Using the Johnson Creek Route to access the SGP could disturb wildlife movement within the Caton Lake, Meadow Creek, Horse Heaven, and Sugar Mountain IRAs. Altering of wildlife habitat within IRAs described under the 2021 MMP would be the same under this alternative. Construction of the Johnson Creek Route along the boundary of the Caton Lake, Meadow Creek, Horse Heaven, and Sugar Mountain
IRAs would extend SGP construction to 5 years. The additional 2 years of construction and 15 years of mine operation would increase the duration when sensitive wildlife species could be displaced from habitats in IRAs adjacent to the Johnson Creek Route.

**Soil, Water, and Air**

Similar impacts to soils as described under the 2021 MMP would occur, but less acres within IRAs would be impacted. Sediment deposition during the construction of the Johnson Creek Route from replacing or clearing culverts would have a temporary impact on water quality. Construction to widen Johnson Creek Route would generate fugitive dust.

**Natural Appearing Landscapes with High Scenic Quality**

The effects on the natural appearing landscapes from constructing the TSF, TSF Buttress, and the new transmission line segment would be the same as the 2021 MMP. Widening Johnson Creek Route would change natural appearing landscapes in adjacent areas within the Secesh, Sugar Mountain, and Horse Heaven IRAs.

**Undeveloped Character**

Under the Johnson Creek Route Alternative, the TSF and TSF Buttress structures and mine closure would have same effect on IRAs as those described under the 2021 MMP.

**Outstanding Opportunities for Solitude and Primitive Recreation**

Using the Johnson Creek Route to access the SGP during construction, operation, and closure and reclamation, would decrease opportunities for solitude in adjacent areas of the Secesh, Sugar Mountain, Horse Heaven, and Meadow Creek IRAs. Under the Johnson Creek Route Alternative, areas that meet the semi-primitive non-motorized recreation setting would be 136,077 acres during the summer (AECOM 2020j) report. During the winter 154,240 acres would meet the semi-primitive non-motorized recreation setting.

Indirectly, the number and size of mine vehicles using Johnson Creek Route could change dispersed recreation use within the 13 IRAs. Some forest visitors may choose to avoid areas where SGP components would be constructed or where the Johnson Creek Route would be used for access. This could increase recreation use in other areas of the 13 IRAs and lands contiguous to unroaded areas.

**Special Features and Values**

The construction of the Johnson Creek Route would have no direct effect on the eligible Burntlog Creek WSR. The Johnson Creek Route Alternative would disturb less acres of special features and areas valued for their scientific qualities, scenic qualities, or other notable distinct features compared to the 2021 MMP as a result of the Burntlog Route not being constructed under this alternative.

**Manageability**

Under the Johnson Creek Route Alternative, the difficulty to manage the Black Lake and Burnt Log IRAs to maintain roadless characteristics would be the same as existing conditions. The components under the
2021 MMP in the Horse Heaven and Meadow Creek IRAs would have the same effect on the ability for the Forest Service to manage these areas to maintain roadless characteristics.

**Research Natural Areas**

**Construction**

Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed, and the 65 mine construction vehicles would use the Johnson Creek Route. During the 5 years of mine construction, the AADT would increase from 57 to 122 vehicles on Johnson Creek Road (CR 10-413), and from 39 to 104 on the Stibnite portion of the McCall-Stibnite Road (CR 50-412). These activities would disperse non-native invasive plant species (Forest Service 2019b; Jacobs et al. 2009). The increase in vehicles, human activity, and the disturbance of vegetation and soils would occur over 3 miles from the two RNAs. These activities would result in negligible direct or indirect effects on the research values, ecological site conditions, and ecological processes within the two RNAs.

Construction of mine access roads under the Johnson Creek Route Alternative would increase in vehicles and delays during the 5 years of construction could indirectly increase recreation use in other areas such as the SFSR. If recreation use on Phoebe Meadows trail (NFST 291) and SFSR East trail (NFST 076) increases, the risk of non-native invasive plant species distribution and establishment would increase (Trombulak and Frissel 2000). Vehicles, clothing, and recreation equipment could transport non-native plant and invasive plant species seeds (Ansong and Pickering 2016; Taylor et al. 2012; Trombulak and Frissel 2000). The potential for non-native plant species to spread into the RNAs depends upon environmental conditions (e.g., soils, climatic influences, vegetation, etc.) and the non-native plant species characteristics, as well as the level of increase in recreation use. Changes in vegetation community composition and structure within the RNAs would occur where non-native invasive plant species become established, soils are compacted, or trails widened, or there is a change in fire frequency. Changes to vegetation composition and structure would result in the long-term loss of research values, ecological site conditions, and ecological processes within the Belvidere Creek RNA.

The application of Forest Plan standards and implementing treatments consistent with the PNF Noxious Weed Program and Idaho’s Noxious Weed Management and Control Program would reduce the potential for non-native plant species to become established within the Belvidere Creek RNA. Non-native invasive plant species could become established within the RNAs. This would result in a localized, negligible to minor, long-term loss of research values, ecological conditions, and ecological processes.

**Operations**

During the 15 years of the mine operation, traffic volumes on Johnson Creek Route would increase. The AADT on Johnson Creek Road would increase from 57 to 125 vehicles, and on Stibnite Road from 39 to 107 vehicles. Forest visitors may choose to avoid Johnson Creek Route due to the increased traffic, increased number of large vehicles, and potential delays during daily maintenance activities. Forest visitors could increase recreation use in the SFSR and Big Creek drainages. Widening Stibnite Road could increase recreation use in the Big Creek drainage. During the summer, if recreation use on Warren-Profile Gap Road (FR 50340), Hamilton Bar (FR 50673), South Fork Road (FR 50674), and Phoebe Meadows Trail (NFST 291) increases, the risk of non-native invasive plant species distribution and
establishment would increase (Trombulak and Frissel 2000). Vehicles and recreation equipment could disperse non-native invasive plant species (Forest Service 2013b, 2015c, 2019k; Jacobs et al. 2009). Non-native plant species could become established within the Belvidere Creek RNA. Changes in vegetation community composition and structure within the RNA would occur where non-native invasive plant species become established, soils are compacted, or trails widened, or there is a change in fire frequency. Changes to vegetation community composition and structure would result in the long-term loss of research values, ecological site conditions, and ecological processes within this RNA.

**Closure and Reclamation**

During the 5 years of mine closure and reclamation, the AADT on Johnson Creek Road increases from existing 57 to 84 vehicles, and on Stibnite Road from 39 to 66 vehicles. Human activity and the disturbance of vegetation and soils would be over 4 miles from any RNA. Belvidere Creek, the RNA nearest to the SGP, is approximately 6 miles north. These activities would result in negligible direct or indirect effects on the research values, ecological site conditions, and ecological processes within this RNA.

During the summer, if recreation use on Warren-Profile Gap Road increased, the risk of non-native invasive plant species distribution and establishment could increase (Trombulak and Frissel 2000). Vehicles and recreation equipment could disperse non-native invasive plant species (Forest Service 2013b, 2015c, 2019a; Jacobs et al. 2009). Non-native plant species could become established within the Belvidere Creek RNA. Changes in vegetation community composition and structure within Belvidere Creek RNA would occur where non-native invasive plant species become established, soils are compacted, or trails widened, or there is a change in fire frequency. Changes to vegetation community composition and structure would result in the long-term loss of research values, ecological site conditions, and ecological processes within the Belvidere Creek RNA, but for the reasons described above these changes are unlikely.

**4.23.3 Mitigation Measures**

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures would be in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Special Designations.

**4.23.4 Irreversible and Irretrievable Commitments of Public Resources**

**4.23.4.1 No Action Alternative**

No irreversible and irretrievable commitments of public resources relating to Wilderness, WSRs, IRAs, or RNAs would occur under the No Action Alternative.
4.23.4.2 Action Alternatives

Wilderness
The extent of and locations where non-native plant species could establish is unknown, but the most likely areas would be along ROWs and access roads. Irretrievable effects on the natural quality of wilderness character within the FCRNRW or recommended wilderness areas would occur where non-native plant species become established. The spread of non-native plant species would be an irretrievable effect on the natural quality of wilderness character.

Under the Johnson Creek Route Alternative, Stibnite Road from the village of Yellow Pine to the SGP would be plowed to support construction, operations, and reclamation and closure. Where and when audible, plowing Stibnite Road from Yellow Pine to the SGP would be an irreversible commitment of solitude.

The increase in human activity in the FCRNRW or recommended wilderness areas would decrease opportunities for solitude, remoteness, and primitive recreation under the action alternatives. The extent of the decrease in the solitude, remoteness, and primitive recreation opportunities quality of wilderness character is unknown; however, following mine closure, recreation use could return to pre-mining levels, and there would be no long-term irreversible commitment of resources.

WSR
If National Register-eligible heritage resources (i.e., historic properties) along Johnson Creek are impacted under the action alternatives, this would constitute an irreversible commitment of an eligible heritage resource, which would have an adverse effect on ORVs.

IRA
Under the 2021 MMP, soil nail walls would remain within the Burnt Log, Black Lake, and Meadow Creek IRAs after decommissioning the Burntlog Route and this would be considered an irreversible commitment of natural roadless character. Soil nail walls would not support vegetation communities or habitat for wildlife species that require large undisturbed areas. Soil nail walls would provide evidence of past human activity, resulting in an irreversible decrease in the undeveloped roadless character within the three IRAs.

Where clearing of the transmission line corridor and access roads remains, there would be an irretrievable commitment of natural roadless character. Where and when audible, plowing Stibnite Road from the village of Yellow Pine to the SGP would be an irretrievable commitment of solitude roadless character.

Under the action alternatives, non-native plant species could spread into the IRAs, and disturbance of wildlife would increase relative to existing conditions. Surveys conducted by Perpetua for 3 years after seeding or planting a disturbed area, and treatment of non-native plant species, could reduce the extent where non-native plant species become established. Where treatments of non-native plant species are successful, vegetation composition and structure could provide high-quality wildlife habitat over years or decades. The extent of where non-native plant species could establish is unknown but would most likely
be along ROWs and access roads. There could be an irretrievable loss of the natural quality of roadless character where non-native plant species become established.

The increase in human activity in the IRA and lands contiguous to unroaded areas would decrease outstanding opportunities for solitude and primitive types of recreation under the action alternatives. The extent of the decrease in associated roadless character is unknown; however, following mine closure, outstanding opportunities for solitude could return to pre-mining levels, and there would be no long-term irreversible commitment of roadless resources.

RNA

The establishment of non-native invasive plant species and human-ignited fire could indirectly change the composition and structure of vegetation communities, the ecological values, and the unique communities within the two RNAs. These potential changes would be an irretrievable loss of research values within an RNA and the Intermountain Region. The extent of non-native invasive species established or within the RNAs listed in Table 4.23-2 or changes in fire frequency from human-ignited fires is unknown.

4.23.5 Short-term Uses versus Long-term Productivity

4.23.5.1 No Action Alternative

No short-term or long-term effects to Wilderness, WSR, IRAs, RNAs would occur under the No Action Alternative.

4.23.5.2 Action Alternatives

Wilderness

The untrammeled, natural, and solitude, remoteness, primitive recreation opportunities qualities of wilderness character would be impacted in both the short- and long-term under the action alternatives. The decrease in solitude where the duration is temporary would be considered a short-term impact. However, the establishment of non-native plant species within the FCRNRW or recommended wilderness would result in a long-term reduction in the natural quality of wilderness character.

WSR

Short-term indirect effects to the setting along WSR-eligible Johnson Creek could result from increased traffic related to mine construction on Johnson Creek Road (CR 10-413) (approximately 65 AADT during construction). These impacts would be temporary, as traffic would be diverted from Johnson Creek Road (CR 10-413) to the Burntlog Route during operations, reclamation, and closure. Construction traffic would not affect the Johnson Creek setting over the long term.

Under the Johnson Creek Route Alternative, Johnson Creek Road (CR 10-413) would be the main route to access the SGP over its entire construction, operation, and closure and reclamation timespan. The duration of effects described in the paragraph above would, therefore, be long-term.
IRA

Short-term uses of areas disturbed for the new transmission line segment and upgraded transmission line would have a long-term effect on solitude in the Horse Heaven, Meadow Creek, and Reeves Creek IRAs. The TSF, TSF Buttress, and retaining soil nail walls along the Burntlog Route would be a long-term loss of soil productivity within six IRAs. There would be evidence of disturbance from the Burntlog Route and the transmission line in the Horse Heaven and Meadow Creek IRAs that would remain long-term. In the long term, areas that were cleared of vegetation for SGP components would be visible from several key viewpoints, resulting in a long-term impact on visual quality within the IRA.

RNA

Under both action alternatives, the research values, ecological site conditions, and ecological processes within the RNAs could be impacted in both the short and long term, although these changes are only likely in the Chilcoot Peak RNA. The increase in risk for non-native invasive plant species to establish within the RNAs where the duration of the surface disturbance is temporary would be considered a short-term impact. However, the establishment of non-native invasive plant species would be a long-term reduction in research values, ecological site conditions, and ecological processes within any of the RNAs.

4.24 Tribal Rights and Interests

4.24.1 Impact Definitions and Effects Analysis Indicators and Methodology

Public and tribal access were identified as a significant issue during scoping for the SGP. Construction and operation of the mine and infrastructure may impact access to NFS lands, travel routes, and tribal rights to access, hunt, gather, pasture, and fish in the SGP area. Other issues related to tribal rights and interests were identified during the scoping process, consultation, and through professional research.

The analysis of effects to tribal rights and interests includes the following issue and indicators:

Issue: The SGP would affect tribal rights and interests through physical, audible, and visual disturbances to tribal resources, through restricting access of tribal members from usual and accustomed fishing places; hunting, pasturing and plant gathering areas; and through changes to the viability and availability of culturally significant fish, wildlife, and plant species.

Indicators:

- Presence of TCPs, CLs, sacred sites or places, usual and accustomed fishing places, and tribal resource gathering areas that may be physically impacted by ground disturbance.
- Presence of TCPs, CLs, sacred sites or places, and tribal resource collection areas that may be impacted by an increase in audible elements (noise and vibrations).
- Presence of TCPs, CLs, sacred sites or places, and tribal resource collection areas that may be impacted by an increase in visual intrusions caused by SGP components.
- Changes in access to TCPs, CLs, sacred sites or places, and tribal resource collection areas due to the restricted access within the Operations Area Boundary.
• Changes to water quality and quantity of both surface water and groundwater in relation to how that affects wildlife, fisheries, and vegetation, or other resources of tribal importance.

• Changes to species viability and/or availability for tribal harvest of culturally important fish, wildlife, and plants and/or their habitat.

• Acres of access and traditional use areas of tribal importance that would be unavailable for the duration of mining activities to exercise treaty rights.

• Known archaeological, cultural resource, and traditional use sites impacted by the Project and visibility of disturbances to these areas.

• Changes in air quality in relation to how that affects wildlife, fisheries, and vegetation, or visibility impacts from fugitive emissions to areas of tribal importance.

The impacts definitions for intensity, duration (FSH 1909.15, 152b), and context are provided in Table 4.24-1.

### Table 4.24-1 Impact Definitions for Tribal Rights and Resources

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>Negligible</td>
<td>There would be no change to the current condition of areas of concern to Tribes as a result of construction, operation, or reclamation of the Proposed Action or Alternatives. There would be no effect to the existing access of specific areas. Archaeological or ethnohistoric cultural resources, areas of elevated spiritual concern, TCPs, or sacred sites would not be affected.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Minor</td>
<td>There would be no discernable change to the current condition of areas of concern to Tribes as a result of construction, operation, or reclamation of the Proposed Action or Alternatives. While a change to the existing access of specific areas may occur, it would not affect that access. Archaeological or ethnohistoric cultural resources, areas of elevated spiritual importance, TCPs, or sacred sites would not be affected to a measurable degree.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Moderate</td>
<td>An easily discernable change to the current condition of areas of concern to Tribes as a result of construction, operation, or reclamation of the Proposed Action or Alternatives would occur. Changes to existing access would occur. Archaeological or ethnohistoric cultural resources, areas of elevated spiritual importance, TCPs, or sacred sites would be affected to a measurable degree.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Major</td>
<td>A large, easily discernable change in condition (e.g., physical, visible, or audible impacts; a change in integrity of the setting or condition of the resource) to areas of concern to Tribes would occur as a result of construction, operation, or reclamation of the Proposed Action or Alternatives. Changes to existing access would occur. Archaeological or ethnohistoric cultural resources, areas of elevated spiritual importance, TCPs, and/or sacred sites would be substantially altered.</td>
</tr>
<tr>
<td>Duration</td>
<td>Temporary</td>
<td>Impacts are anticipated to last no longer than 1 year.</td>
</tr>
<tr>
<td>Duration</td>
<td>Short-Term</td>
<td>Impacts would last up to 3 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Long-Term</td>
<td>Impacts would last longer than 3 years.</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>Impacts would remain after reclamation.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Context</td>
<td>Localized</td>
<td>Effects would be limited to archaeological sites or properties of tribal importance within the analysis area.</td>
</tr>
<tr>
<td>Context</td>
<td>Regional</td>
<td>Effects would occur to archaeological sites or properties of tribal importance outside of the analysis area.</td>
</tr>
</tbody>
</table>

Intensity is the severity or levels of magnitude of an impact. Duration is the length of time an effect would occur. Context is the effect(s) of an action that must be analyzed within a framework, or within physical or conceptual limits.

### 4.24.2 Direct and Indirect Effects

#### 4.24.2.1 No Action Alternative

Under the No Action Alternative, the current ability of Tribes to access NFS lands in the analysis area and specifically the mine area would not change. Project related ground disturbance, visual and audible impacts, and impacts to culturally significant subsistence resources including fish, wildlife, and plant species would not occur. Legacy impacts from historic mining of the area would not be reclaimed other than those identified in the Administrative Settlement Agreement and Order on Consent (ASAOC, EPA and USFS 2021). Currently, there are ongoing releases of hazardous substances, pollutants, and contaminants to surface water and groundwater at the mine site including elevated concentrations of antimony, arsenic, copper, lead, mercury, and cyanide. Most notable are elevated concentrations of arsenic and antimony. Past mining activities have also caused alterations to stream configurations and habitat including the Yellow Pine pit lake, sediment and tailings deposits, development rock dumps, and channel diversions. Legacy mining effects would continue to alter the nature and potential use of the usual and accustomed fishing places and springs. Activities under the ASAOC would include construction of stream diversion ditches to avoid contact of water with sources of contamination and removal of development rock and tailings from Meadow Creek or the East Fork SFSR that are currently impacting water quality.

The No Action Alternative would not preclude Perpetua from submitting another plan of operations in the future. Perpetua would continue to implement surface exploration and associated activities that have been previously approved on the NFS lands as part of the Golden Meadows Exploration Project, per the Golden Meadows Exploration Project Plan of Operations and the Golden Meadows Exploration Project Environmental Assessment (Forest Service 2015).

#### 4.24.2.2 2021 MMP

The 2021 MMP would result in adverse impacts to some of the natural resources that the Tribes may utilize in the exercising of their treaty rights. Long-term, minor impacts would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence. However, it is understood that any loss of the ability to implement treaty rights would be a major impact to the Tribes. The following analysis describes the effects to tribal rights and interests.

Information received from the Tribes’ ethnographies indicate that areas, resources, and off-reservation rights of concern and importance include disruption of traditional practices, tribal worldview, fishing rights in the SFSR watershed, including the East Fork SFSR, Meadow Creek, Fiddle Creek, West End
Creek, No Man’s Creek, and Sugar Creek (Battaglia 2018; Lahren 2020; Walker 2019). Tribally significant travel corridors and waterways include portions of the historic Old Thunder Mountain Road (FR 440), portions of the historic Burnt Log Road, the East Fork SFSR watershed system which includes several tributaries, and the Riordan Lake shore. Traditional mineral and plant gathering locations or collection areas within the analysis area also were cited as important to the Nez Perce Tribe, but exact locations of these collection areas have not been shared. Other landscape features of importance include Riordan Lake and prominent points on the landscape (e.g., mountain tops and ridgelines) that have religious significance, and traditional plant gathering locations or collection areas.

Quantifications (context, duration, and intensity) are assigned to the impacts to resources such as wildlife or water quality; however, it is difficult to quantify or otherwise determine the impact of a temporary to long-term loss of a right. In consultations with the Tribes, they noted that any loss of treaty rights is significant to them and could potentially affect all tribal members.

**Tribal Historical/Archaeological Sites**

Effects to tribal historical and archaeological sites could occur during all phases of the SGP including construction, operations, exploration, and reclamation. However, it should be noted that effects to historic and archaeological resources during the reclamation phase would likely be avoided because impacts associated with historic properties in the reclaimed areas have already taken place or measures would be in place to avoid impacts to these known locations. There is one known pre-contact archaeological site identified as the Stibnite Lithics Site, within the Operations Area Boundary that would be avoided through protective measures (i.e., fencing); protective measures would also prevent inadvertent impacts resulting from SGP activities. No pre-contact archaeological sites are located within the physical APE for the Burntlog Route, however two historic tribal travel routes, including the Thunder Mountain Road, do intersect the Burntlog Route and could be affected. The Thunder Mountain Road and Burnt Log Road, prior to its use by settlers, included portions of well-traveled tribal routes. The current research indicates that there are five pre-contact archaeological sites located within the transmission line improvement areas; however, it is anticipated that these sites would be avoided through design alterations or protective measures. Further, consultation with the Tribes would be ongoing; therefore, if additional potential impacts are identified such as discoveries of cultural significant sites or resources during or post construction, formal government-to-government consultation would occur. The impact to tribal historical and archaeological sites would be localized, temporary to permanent, and negligible to minor.

**Sacred Sites, Traditional Cultural Properties, and Cultural Landscapes**

Impacts to non-archaeological tribal sites including sacred sites or places, TCPs, and CLs, could occur during all phases of the SGP including construction, operations, exploration, and reclamation. Currently, there are no known sacred sites within the Operations Area Boundary, however tribal consultation and the preparation of the confidential tribal ethnographies have identified a TCP District within the analysis area. Consultation regarding sacred sites, the identified TCP, and CLs is ongoing.

Restricted or altered access to the mine site area during construction and operation closures would affect tribal access to important sites, some that could be identified as TCPs and CLs. The Stibnite and Thunder Mountain roads through the SGP would be closed during the mine operations, potentially restricting access to important tribal resources and sites. In locations where viewsheed and a sense of solitude is
important to the cultural significance, interruptions from noise, vibrations, and alterations in the landscape, could adversely affect a significant aspect of religious and sacred sites or places. Although impacts from construction noise would be temporary and intermittent, these intrusions may potentially disrupt tribal religious and cultural practices. Traditional cultural uses of the area, including tribal fishing, hunting, gathering, and spiritual practices would also be potentially affected by the construction, operation, and reclamation phases of the SGP.

The SGP would create permanent landscape alterations within the Operations Area Boundary, as well as the local landscape if visible outside the Operations Area Boundary. Changes to the landscape would have negligible to moderate impacts on sacred sites or places, TCPs, or CLs that may exist depending on whether they could be seen from those locations. The change in the visual landscape resulting from the introduction of new infrastructure may alter the landscape in such a way as to detract from the cultural significance. The impact to sacred sites or places, TCPs, or CLs would be localized, temporary to permanent, and negligible to major.

*Traditional Use Sites*

In addition to the permanent alterations of the SGP Operations Area, the 2021 MMP would cause changes to the local landscape that may include traditional use areas. Changes to the landscape would have localized, long term to permanent, negligible to major impacts on nearby ceremonial or traditional use sites that may exist, depending on whether the changes could be seen from those sites.

Construction and operation of the SGP would impact access to traditional use areas and subsistence resources. Public and tribal member use would generally not be allowed in the mine site footprint, areas adjacent to the mine site (i.e., the Operations Area Boundary), the upgraded transmission line ROW, and the new transmission line ROW from Johnson Creek Substation to the mine site. Approximately 13,441 acres of public lands within the Operations Area Boundary (14,221 acres) would become inaccessible to the Tribes once construction begins and would continue through closure and reclamation. SGP on-site and off-site facility construction and operation could also impact traditional use areas and subsistence resources through habitat loss; behavioral disturbance to wildlife from increased noise and human activity; concerns about contamination of resources; and avoidance by tribal members of traditional use areas.

The disruption of traditional practices, tribal worldview, viewshed characteristics and solitude, and fishing rights in the SFSR watershed, including the East Fork SFSR, Meadow Creek, Fiddle Creek, West End Creek, No Man’s Creek and Sugar Creek are of concern to the Tribes. Tribally significant travel corridors and waterways include portions of the Old Thunder Mountain Road (National Forest System Road 440), portions of the Burnt Log Road (National Forest System Road 414), the East Fork SFSR system, which includes several tributaries, and the Riordan Lake shore.

*Land Status and Access*

There would be no change in land ownership status. The federal portion of the affected land would remain under federal ownership. The use of lands for mining operations and associated facilities would be long-term; lands would be reclaimed and structures removed after mining was completed. Mining is governed

Construction and operation of the SGP would impact access to traditional use areas and subsistence resources if they are located within the Operations Area Boundary. Public and tribal member use would generally not be allowed in the mine site footprint and areas adjacent to the mine site (i.e., the Operations Area Boundary). There would be a long-term loss of access to land for exercising treaty rights, usual and accustomed fishing places, access to streams and fountains, and access to potential sacred sites or places, TCPs, CLs, and historic properties within the Operations Area Boundary while the lands are occupied for mining. Therefore, a mitigation measure for access impacts would be incorporated into any decision on the SGP.

The SGP mine area has been the object of mining and exploration since the 1930s with vehicle access associated with mine access roads (e.g., Stibnite Road, Thunder Mountain Road). As such, the area has been affected by historical mining that has altered the nature and potential use of usual and accustomed fishing locations and springs. Hence, there is no archeological, ethnographic, or historical evidence of recent or present use according to the affidavit (Greiser 1998), which is consistent with use of the area for mining. Site reclamation and restoration efforts included in the project following its operational period would result in similar or improved stream conditions and access for usual and accustomed fishing places in the Operations Area Boundary. However, until conclusion of reclamation and restoration efforts, mining effects would continue to alter the nature and potential use of the usual and accustomed fishing locations and springs.

However, lands within the Operations Area Boundary have been highly disturbed by past mining activities. The SGP would expand the mining disturbance and increase industrial development. The SGP mining area would disturb approximately 1,675 acres, which would be much less than one percent of the PNF; a negligible long-term impact. There are no known subsistence resources located exclusively within the Operations Area Boundary that are not available on the remaining portions of the PNF. However, access to potential scared sites or places, TCPs, CLs, and historic properties that may have specific significance at their location(s) within the Operations Area Boundary could be impacted in way that cannot be offset by access to other in-kind areas. There would be a long-term loss of approximately 13,441 acres of federal land associated with land occupancy within the Operations Area Boundary under the 2021 MMP, which represents less than 0.3 percent of the BNF and PNF (2.3 million and 2.6 million acres, respectively). After mine closure, hunting, fishing, and gathering areas would be restored through reclamation and revegetation of disturbed areas and wildlife would return. Tribal members would regain access to the federal lands. There are no known types of natural resources available for exercising treaty rights in the Operations Area Boundary that are not available on the surrounding NFS lands. The impact to federal land available for treaty rights access from the 2021 MMP would be localized, long term, and moderate. While offsite presence of tribal resources means the impact to overall access to a specific resource would be negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.
The Burntlog Route would create additional access into a remote area. Although this could provide access to additional areas to exercise treaty rights, mine traffic as well as other public users that use this access would impact current solitude. The impact would be localized, long term, and minor to major.

The Operations Area Boundary (14,221 acres) represents less than one percent of the total area within the PNF and BNF (2.3 million and 2.6 million acres, respectively) available to the Tribes to conduct their traditional use of and access to subsistence resources. However, these previously accessible lands would become inaccessible for a generation, thus potentially disrupting the transfer of place-based traditional knowledge from generation to generation. In addition, closed access to potential specific religious or culturally significant sites may not be offset by access to other in-kind sites. All other existing areas outside of the Operations Area Boundary would remain fully accessible for hunting, fishing, gathering, and other traditional land uses. The overall impact to treaty rights access from the 2021 MMP would be localized, long term to permanent, and minor to major depending on the type of tribal use for the area.

Existing public access roads would remain open under the 2021 MMP. There would be a public access road route through the mine site during the SGP construction, operations, and closure and reclamation phases. Public (including tribal) motorized access to active mine areas, including haul/access roads, would be restricted during the life of the SGP. Non-motorized access (i.e., walking, hiking, horse) would be restricted in the Operations Area Boundary as well. The impact would be localized, long-term, and moderate.

Tribal access within the Operations Area Boundary would resume following closure of the SGP. However, reclamation could modify the fish, wildlife, and vegetation composition of the area compared to existing conditions. Therefore, traditional land uses could be altered by reclamation. The impact to Tribal access after reclamation would be localized, long term to permanent, and negligible to major.

Authorization of the SGP would require Forest Plan amendments. No standards and guidelines were identified that are strictly applicable to tribal resources; however, a number of standards and guidelines are related to resources considered important or sacred by Tribes, including wildlife, water resources, and scenic resources.

**Water Resources**

The 2021 MMP would have impacts to stream flow volumes, water chemistry and temperature, and fish occupancy, as described in the Water Quantity (Section 4.8), Water Quality (Section 4.9), and Fish Resources and Fish Habitat (Section 4.12) Section. Mitigation measures along with EDFs to address those impacts would be incorporated into any decision on the Project. Runoff associated with the SGP would be contained, which would minimize contribution of sediment to local streams. Water quality of surface flow departing from the Operations Area Boundary would be the same or better than baseline conditions (Section 4.9). Surface water available for tribal use in the area would not be impacted above human drinking water standards by the SGP. The potential for the SGP to cause changes in surface water quality from increased erosion and sedimentation, changes in temperature, and changes in general water chemistry (i.e., pH, temperature, major ions, total dissolved solids and dissolved metals, and organic carbon) are discussed in detail in the Water Quality Specialist Report (Section 4.9).
Active contact water collection and water treatment would be required for a period of time during the operations and post-closure period until geochemical stability of mined materials could be achieved. The water treatment would prevent mine-impacted waters with elevated analyte concentrations from contacting surface water in the environment. The effects of capture, treatment, and discharge of mine-impacted waters on surface water chemistry would be localized, long-term, and minor.

Surface waters also would be impacted by modification of temperature due to removal of shading vegetation, development of pit lakes, and modification of stream depth during construction, operations, or the post closure/reclamation period. Changes in stream water temperatures for the East Fork SFSR would be negligible to major, localized, and long term. Design features to reduce stream temperatures in the East Fork SFSR would take approximately 10 years to implement post-closure. Temperature changes in the restored Meadow Creek would be a localized, long-term, and major impact. Temperature changes in West End Creek would be permanently raised compared to existing conditions resulting in a localized, permanent, and major impacts.

Under the 2021 MMP, there would be 71 access road stream crossings with increased potential for sedimentation and risk of inadvertent spills. The effect to surface water quality as a result of sedimentation and erosion would be limited by applicable environmental protection measures and control techniques, by the limited duration of active surface disturbing activities, and by the adaptability of the receiving environment. The extent of sedimentation effects from erosion and fugitive dust would be concentrated at the SGP and along the Burntlog and Johnson Creek access routes; however, due to the nature of sediment transport by streams, the geographic extent of the impact could extend farther downstream in the East Fork SFSR. The effects of the SGP on sedimentation are expected to be localized, long term, and moderate.

Both surface water and groundwater quality could potentially be impacted by accidental spills and releases of fuels and hazardous chemicals used in mine construction or operations. Implementation of required standard design, permit stipulations, and regulatory requirements governing storage and handling of these materials would reduce the risk of spills and promote effective response should a spill occur, which would limit impacts to both surface water and ground water quality. Should accidental spills or releases of fuels and hazardous chemicals occur, the impact(s) would be localized, temporary, and minor to moderate.

For risks associated with the consumption of fish, the Idaho human health fish tissue criterion for methylmercury is 0.3 mg/kg. Under baseline site conditions, fish tissue concentrations have not exceeded that criterion (MWH Americas 2017). The current EPA water quality standard (12 ng/l) and a NMFS proposed standard (2 ng/l) for total mercury are based on human consumption of fish. Site baseline total mercury concentrations range between 2.4 and 5.7 ng/l and methylmercury concentrations are less than 0.1 ng/l. Water treatment would be required under any action alternative in order to not exceed baseline conditions. Proposed water treatment associated with the 2021 MMP would maintain methylmercury concentrations below 0.1 ng/l and, at that concentration, would not modify fish tissue concentrations compared to the baseline condition.

Overall effects of impacts to water resources on tribal treaty rights and resources, in particular fisheries, but also plant and wildlife populations, would be localized to regional, long term to permanent, and
major. Impacts to water resources also has the potential to impact the integrity of potential historic properties, sacred sites or places, TCPs, and CLs in the analysis area as these cultural properties relate to tribal treaty rights and resources.

Access to streams, springs, and fountains within the Operations Area Boundary would be restricted for the life of the SGP (approximately 20 years). This would constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to access to streams, springs, and fountains. Because access to the usual and accustomed fishing locations along streams and springs would be impacted by the project, a mitigation measure for access impacts would be incorporated into any decision on the project.

Wetlands

The 2021 MMP would result in a loss of wetlands and riparian areas. Because wetlands and riparian areas provide a broad range of ecological functions, the loss or alteration of wetland and riparian acreages would have indirect effects on other resources within each of the affected drainage basins. Potential indirect impacts would include reductions in water quality and water storage/recharge, as well as loss of habitat. Regarding habitat, numerous wetland-dependent species, including fish, amphibians, and birds would be displaced from the SGP into other areas that may or may not be available and may provide less suitable habitat. Within the Operations Area Boundary, approximately 28 percent of the existing wetlands within the contributing basin for the East Fork SFSR watershed above the Sugar Creek/East Fork SFSR confluence would be impacted, all of which are within the Headwaters of the East Fork SFSR, a place of known importance to the Tribes. These wetlands impacts would affect water quality, water storage/recharge, and therefore flow. Additional details are provided in Section 4.11 Wetland and Riparian Resources. The impact to wetlands would be localized, temporary to permanent, and major which could result in localized, temporary to permanent, and major impacts to usual and accustomed fishing places along Sugar Creek and portions of the East Fork SFSR, as well as tribal treaty rights and resources including those associated with potential historic properties, sacred sites or places, TCPs, and CLs depending on the wetland and the type of tribal use.

As part of the Clean Water Act, Section 404 permit, a compensatory mitigation plan would be required to compensate for lost wetland areas and their associated functions. It would also address the temporal loss of aquatic functions and values. There would be a temporal loss of wetland functions in the Salmon River drainage for approximately 20 years (Section 4.11).

Fisheries

During construction and operations, fish bearing streams would be diverted into ditched channels and some new barriers would be created; however, enhancements would occur in some stream channels and existing barriers to natural fish movement would be removed. Entrainment by in-stream activities or human-made features, flow reductions, temperature changes, changes in habitat structure, water quality changes, and reduced access to suitable habitat may affect the distribution and relative abundance of fish populations in affected streams in the SGP area thereby affecting availability and harvestability by the Tribes. Additional impacts to specific fish (i.e., Chinook salmon, westslope cutthroat trout, steelhead trout, bull trout etc.) is detailed in Section 4.12 Fisheries and Aquatic Resources. Impacts to fisheries would be a localized, long-term to permanent, major impact to tribal treaty rights and resources including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.
**Vegetation**

Vegetation would be cleared in order to construct the mine facilities, access roads, and associated infrastructure. Clearing would likely include plants of traditional, cultural, and religious importance to the Tribes including whitebark pine, limber pine, lodgepole pine, sweetgrass, bitterroot, and subalpine fir trees. The 2021 MMP would impact approximately 259.5 acres of occupied whitebark pine habitat and would remove an estimated 1,235.8 individual trees, 23 of which would be mature, cone-bearing individuals. This would result primarily in localized, long-term to permanent, moderate impacts to whitebark pine populations.

The one known occurrence of sweetgrass, located along the Burntlog Route, would be indirectly impacted during proposed upgrades to the route if the alternative is selected. The impact would be localized, long term to permanent, and moderate to major.

The one known occurrence of bitterroot, located in the transmission line corridor, could also be indirectly impacted during construction of the transmission line upgrade. The impact would be localized, long term, and negligible to moderate.

Several subpopulations of a single occurrence of bent-flowered milkvetch, occur to the east of the SGP and there is one subpopulation in proximity to the West End Creek diversion. Further, modeled habitat for this species would be impacted. The impact would be localized, long term, and negligible.

There are no known plant-based subsistence resources located exclusively within the Operations Area Boundary that are not available on the remaining portions of the PNF. Other plant populations of tribal traditional and cultural significance not already specifically identified would not be available within the Operations Area Boundary for the life of the mine. While offsite presence of plants means the impact to overall access to a specific type of plant would be negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.

Vegetation clearing could also impact pasturing treaty rights. While pasturing locations would be available in other offsite locations, this would still constitute a localized, long-term, and negligible to moderate impact.

Reclamation would include revegetation with short-lived grass species intended to help stabilize the reclaimed surfaces from erosion as well as long-lived native bunch grass communities that are structurally diverse and allow succession of native species over time. Other native forbs, shrubs, and trees could be seeded or planted in clusters where they are most likely to establish. Some plant species of tribal traditional and cultural significance would be included.

**Noxious Weeds and Invasive Species**

Non-native plant and noxious weed control measures for preventing and controlling noxious weed infestations would be utilized for the SGP as described in Section 4.10. Perpetua would implement Forest Service-required design features (Section 2.4.9) that meet the intent of all applicable noxious weed and
non-native species standards from the Payette and Boise Forest Plans (Forest Service 2003, 2010a). With the implementation of these measures, potential for colonization and spread of noxious weeds and invasive species in disturbed areas would be reduced. Despite weed management by Perpetua, the disturbance at the SGP would cause an increased threat of weed infestation at and near the SGP which would be a localized, long term, and negligible to minor impact to tribal use of vegetation.

**Wildlife**

**Big Game**

Impacts to big game would involve displacement and alterations of normal movement routes. Although there are no identified wildlife migration corridors between winter and spring ranges, elk are predicted to use the area for calving in the summer, and big game animals likely use the wildlife analysis area to migrate. If big game must reroute around disturbances, it could increase their energy expenditures during migration, potentially decreasing survival or productivity. However, given the relatively small size of the mine site in context of the region and available habitat, any direct effect on survival or productivity would likely be negligible. Roadways under the 2021 MMP may displace elk and mule deer or increase the possibility of vehicle-wildlife collisions. The 2021 MMP may directly and indirectly impact big game species individuals and habitat. Tribal members could continue to pursue hunting on adjacent lands to which these species would likely migrate when SGP activities commence. While offsite presence of big game means the impact to overall hunting access is negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Rocky Mountain Bighorn Sheep**

There would be a direct loss of habitat which would displace any individuals that occur in those areas. The mine site and associated infrastructure may displace sheep around the perimeter of the disturbances. Rocky Mountain bighorn sheep are very mobile and able to avoid localized direct threat of injury or mortality. Although additional roadways near the mine site could expose individuals to direct vehicle collisions and mortality. Because bighorn sheep are known to occur in the FCRNRW area, they could potentially be affected by loss of potential habitat along the Burntlog Route. The 2021 MMP would result in localized, short-term to permanent, minor impacts to bighorn sheep.

**Gray Wolves**

Wolves may alter their normal movement patterns to avoid the SGP, but no direct impacts to individuals or populations are expected. There would be a long-term, localized, minor impact to habitat. Displacement could expose them to increased competition with other wolf packs as they seek new territory and would be a potential indirect effect. Vehicle traffic associated with the Burntlog Route could increase the risk of wildlife-vehicle collisions. The 2021 MMP may directly and indirectly impact gray wolf individuals and habitat (i.e., general habitat types), but would not likely contribute to a trend towards ESA listing or loss of viability of the species within the planning area. Therefore, the SGP would result primarily in localized, short-term to permanent, minor impacts to the gray wolf.
Wolverine

Wolverines have been well documented in the analysis area (Section 4.13). The 2021 MMP may directly or indirectly impact wolverine individuals and habitat resulting in adverse impacts but would not jeopardize the continued existence of the species. The 2021 MMP would result primarily in localized and long-term impacts to the wolverine, particularly the local population (part of larger Central Idaho sub-populations).

Small Mammals and Birds

Any bird individuals in the mine area would be displaced, and noise or increased human presence may cause moderate effects to birds in the vicinity for the duration of active mining and reclamation activities. No direct mortality is expected. Some individual small mammals such as rabbits, yellow-bellied marmots, and squirrels in the disturbance areas would be displaced or killed. Displaced individuals may cause increased competition in adjacent populations that may lead to increased mortality or decreased reproductive rates. While offsite presence of small mammals and birds means the impact to overall hunting access is negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs. The 2021 MMP would result primarily in localized, short-term to long-term, negligible to minor impacts for small mammals and bird species.

Treaty Rights Access

Due to their unique tribal rights, cultural relationships, and uses of the lands within the local area, the Tribes could potentially be impacted more specifically and widely by changes in access, use, and resource conditions in the SGP mine area. The Tribes have multiple and inter-related interests and associations with the local area resources (e.g., religious, traditional, and subsistence uses). Many of these interests also are inherently incompatible with any resource changes, including increased presence or alternate use of the local area by non-tribal individuals or entities. Access, or the continued availability of the traditional natural resources, would be affected by the SGP. There would be a long-term loss of approximately 13,441 acres of federal land within the 14,221-acre Operations Area Boundary associated with land occupancy from mining activities under the 2021 MMP, which represents less than one percent of the PNF. After reclamation, fishing, hunting pasturing, and gathering areas would be restored through revegetation of disturbed areas (except for approximately 278 acres of unreclaimed areas) and wildlife would return. Tribal members would regain access to the federal lands. There are no known types of natural resources available for exercising treaty rights in the SGP area that are not available on the surrounding NFS lands. It is difficult to quantify or otherwise determine the impact of a temporary loss of a right. While offsite presence of tribal resources means the impact to overall fishing, hunting, pasturing, and gathering access would be negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those tribal resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs. In consultations with the Tribes, they noted that any loss of treaty rights is significant to them and could potentially affect all tribal members. The Tribes would not be able to exercise treaty rights in the Operations Area Boundary for the life of the SGP, which would be a localized, long term, moderate to major impact on tribal treaty rights.
The Tribes have multiple and inter-related interests and associations with the local area resources (e.g., religious, sacred site, traditional, and subsistence uses). Many of these interests also are inherently incompatible with any resource changes, including increased presence or alternate use of the local area by non-tribal individuals or entities. In general, the SGP impacts to subsistence resource availability on tribal communities with environmental justice concerns could potentially be adverse and would be localized, long term to permanent, and moderate to major.

**Noise**

There would be noise impacts at the SGP and associated SGP components during construction. Noise would likely displace larger wildlife and change recreational or traditional use experiences including viewsheds and sense of solitude in areas proximate to construction activities. The Burntlog Route would be in close proximity to the FCRNRW and construction noise would impact closer areas of the FCRNRW but would gradually attenuate to being unnoticeable with distance. Topography and vegetation would help to attenuate noise. However, noise impacts during construction would generally be localized, temporary to short-term, and negligible to moderate depending on proximity to activity. Mine and associated infrastructure development and associated noise during the construction phase would be limited to daytime hours (between 7:00 a.m. and 10:00 p.m.).

During operations there would be long-term but periodic noise impacts due to SGP operations and road maintenance activities. Access road traffic and maintenance would impact some areas of the FCRNRW, with impacts diminishing with distance from the wilderness boundary. Impacts from operations would not extend as far into the wilderness area as they would during construction. Overall, noise impacts would be localized, temporary to long term, and negligible to moderate for tribal resources (i.e., wildlife), tribal treaty rights and traditional use experiences, and solitude including aspects associated with potential historic properties, sacred sites or places, TCPs, and CLs within the analysis area and proximate portions of the FCRNRW.

**Visual Resources**

There would be new disturbances in the Operations Area Boundary which would change the local landscape character. However, scenic integrity is low where there are existing disturbances from historical mining activities as the landscape has been heavily altered. Construction of the Burntlog Route would result in the greatest change in landscape character and scenic quality. During construction and operations, where these changes could be seen from traditional use or ceremonial sites, visual contrasts would be a localized, long-term, and negligible to major impact to tribal treaty rights and traditional use experiences including those associated with potential historic properties, sacred sites or places, TCPs, and CLs. After reclamation, visual impacts would lessen.

**Recreation**

There would be impacts to solitude, and the temporary to long-term loss of dispersed recreation opportunities in the area disturbed by the SGP during construction. Although, as described previously, current tribal recreation opportunities in the Operations Area Boundary are very limited due to the existing mine disturbance and inaccessible private property that occur within or immediately adjacent to the mine area. The limited opportunity for tribal treaty rights and traditional use experiences would be re-established in the Operations Area Boundary following reclamation. Recreation impacts to the Tribes
would be localized, temporary to permanent, and negligible to major including practices associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Air Quality**

Air quality impacts would not exceed NAAQS (Section 4.2). The change in atmospheric visibility would be less than the 5 percent change in light extinction that is considered the significance criteria for Class I areas (FLAG 2010). Consequently, the level of regional haze impact would be localized, long term, and minor. Impacts to tribal treaty rights and tribal resources associated with potential historic properties, sacred sites or places, TCPs, and CLs due to haze would be localized, long term, and negligible to minor.

**Socioeconomics**

Construction period usage of the Johnson Creek Route would increase traffic and activity on an existing roadway along portions of Johnson Creek where the Johnson Creek Artificial Propagation Enhancement fisheries restoration program is active. The socioeconomic components for the fisheries restoration program (e.g., road access, employment) would observe short-term, negligible effects from the increased use of the Johnson Creek Route during construction. There could be direct socioeconomic impacts from restricted or denied tribal treaty rights associated with harvest opportunities in the Operations Area Boundary and/or areas where construction activities are taking place. Lost opportunities during construction would be localized, short-term, and negligible to minor as subsistence resources are available in other areas of the Boise and Payette National Forests. Impacts would be localized, long-term, and negligible to minor within the Operations Area Boundary for the same reason.

**Environmental Justice**

The SGP area is within the traditional subsistence range of tribal communities with environmental justice concerns. Tribal members are more susceptible and likely to be impacted by local area resource changes due to both their use of the area and their long-established cultural connections and attitudes to the local area resources. For these reasons, if there are adverse impacts to water, fisheries, and wildlife resources, tribal members would have a greater potential to be affected than the general population.

None of the SGP components are on reservation lands, and no significant adverse biological impacts (e.g., wildlife and vegetation resources), public health impacts (e.g., contamination of fish in local streams), or other physical impacts (e.g., air quality and noise) are identified that would directly impact reservation lands and their Tribal environmental justice communities that are located outside of the SGP area. However, the SGP could affect Tribal members’ access to subsistence or traditional use of the lands within the SGP area. Currently, there is no restricted access on NFS lands in the SGP area. Some restrictions are in place on private lands. As a result, the potential for any adverse and disproportionate SGP-related impacts to the tribal environmental justice communities would be limited to changes in access for tribal members, and subsistence or traditional use of the lands, such as fishing in usual and accustomed places. Under the 2021 MMP, impacts to subsistence resource availability on tribal communities with environmental justice concerns could potentially be adverse and would be localized, long-term to permanent, and moderate.

There are no substitute resources or replacement opportunities for location-specific tribal interests and use of the local area. As a result, tribal members are more likely to be impacted by local area resource
changes than the general public. However, specific information from the Tribes regarding the exact nature, duration, and location of impacts on tribal populations resulting from the excluded areas for the SGP and/or resource impacts is not available in the public domain. Based on the restricted ethnographic information provided to the Forest Service by the Tribes, it is expected that the SGP-related impacts would be of a type and/or magnitude to represent an adverse environmental justice impact to the tribal environmental justice communities.

4.24.2.3 Johnson Creek Route Alternative

Tribal Historical/Archaeological Sites

Within the Operations Area Boundary, impacts to Native American archaeological sites would be the same as described under the 2021 MMP. Under the Johnson Creek Route Alternative, the Burntlog Route would not be constructed. Rather, the Johnson Creek Route (Johnson Creek and Stibnite roads) would require upgrade and widening to improve the road for operations traffic. There are six previously identified Native American archaeological sites within the physical APE along Johnson Creek Route that could be potentially affected by the SGP. However, physical impacts to these sites would be avoided through design or protective measures. Consultation with the Tribes would be ongoing; therefore, if additional potential impacts are identified such as discoveries of cultural significant sites or resources during or post construction, formal government-to-government consultation would occur. If sites could not be avoided or another type of impact were identified (visual, auditory, or vibratory), the impact to Native American archaeological sites would be localized, temporary to permanent, and negligible to minor.

Sacred Sites or Places, Traditional Cultural Properties, and Cultural Landscapes

Impacts to non-archaeological tribal sites including sacred sites, TCPs, and CLs, could occur during all phases of the SGP including construction, operations, exploration, and reclamation. Currently, there are no known sacred sites within the Operations Area Boundary, however tribal consultation and the preparation of the confidential tribal ethnographies have identified a TCP District within the analysis area. Portions of the Johnson Creek Road in the Nez Perce Tribe’s ethnography has been identified as a traditional travel route. Further documentation and the evaluation of the site as a historic property informed by tribal consultations is ongoing. In addition, consultation regarding sacred sites or places, the identified TCP District, and CLs is ongoing with all tribal partners.

Impacts to sacred sites or places, TCPs, and CLs would be the same as described for the 2021 MMP for the Operations Area Boundary. As the Burntlog Route would not be constructed under the Johnson Creek Route Alternative, there would be no change to the landscape along that route. Overall, there would be fewer changes to the landscape under the Johnson Creek Route Alternative. However, changes to the landscape relating to the Johnson Creek Route Alternative resulting from the SGP would have localized, long term, and negligible to moderate impacts on sacred sites, TCPs, or CLs that may exist depending on whether the changes could impact the integrity of said properties and the tribal experiences associated with them.
Traditional Use Sites

Impacts to traditional use sites would be the same as described under the 2021 MMP within the Operations Area Boundary. As the Burntlog Route would not be constructed, there would not be any changes to the local landscape or traditional use areas along that route. The Johnson Creek Route would be widened and improved to accommodate operations traffic but generally would not cause additional changes to the landscape, therefore it would have localized, long-term, and negligible to moderate impacts on nearby ceremonial or traditional use sites that may exist along that route or depending on whether impacts and alterations could be seen from other locations where additional ceremonial and traditional use sites may occur.

Land Status and Access

There would be no change in land ownership status. The federal portion of the affected land would remain under federal ownership and access would remain the same. The impact to federal land available for treaty rights access from the Johnson Creek Route Alternative would be localized, long term, and negligible.

Water Resources

Impacts from construction and operations at the SGP would be the same as the 2021 MMP. However, the Burntlog Route would not be constructed and therefore there would be 21 fewer stream crossings. The Johnson Creek Route would be upgraded and improved for use during operations which would increase the potential for additional sediment load and inadvertent spills into Johnson Creek and the East Fork SFSR as well as the other streams crossed by this route. The effects of the Johnson Creek Route Alternative of sedimentation would be localized, long-term, and moderate.

Similar to the 2021 MMP, effects of impacts to water resources on tribal treaty rights and resources, in particular fisheries, would be localized, long-term to permanent, and major.

Wetlands

Impacts from construction and operations at the SGP would be the same as the 2021 MMP. However, the Burntlog Route would not be constructed and therefore there would be no impacts to wetlands along that route. Impacts to wetlands and riparian areas associated with widening, maintenance, and use of the Johnson Creek Route would be similar to the wetland impacts associated with the Burntlog Route. These include direct loss, fragmentation, and indirect effects such as dust. Wetlands and riparian areas along Johnson Creek are lower in their respective watershed (i.e., further downstream) as the route is largely located along the East Fork SFSR (Section 4.11). Thus, the road impacts would affect wetlands and riparian areas at the confluences of several drainages that feed into the East Fork SFSR, which would have a larger effect on the river. The impact to wetlands would be localized, temporary to permanent, and major which could result in localized, temporary to permanent, and major impacts to tribal treaty rights and resources including those associated with potential historic properties, sacred sites or places, TCPs, and CLs depending on the wetland and the type of tribal use.
**Fisheries**

Impacts to fisheries and aquatic resources from construction and operations of the SGP would be the same as the 2021 MMP within the Operations Area Boundary. However, the Burntlog Route would not be constructed and therefore there would be no impacts to fisheries or aquatic resources along that route. The Johnson Creek Route would be upgraded and improved for use during operations which would increase the potential for impacts due to sedimentation and inadvertent spills to Johnson Creek and the East Fork SFSR. Additional impacts from the Johnson Creek Route Alternative to specific fish is detailed in Section 4.12. Impacts to fisheries would be a localized, long-term to permanent, and major to tribal treaty rights and tribal resources including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Vegetation**

Impacts to vegetation within the Operations Area Boundary would be the same as those described under the 2021 MMP. There would be additional impacts along the Johnson Creek Route as it would be used for access during mine construction, operations, and closure and reclamation; therefore, it would require substantial upgrades. Under this alternative, the Burntlog Route would not be constructed, therefore there would not be the associated vegetation impacts along that route, such as those related to whitebark pine, limber, pine, lodgepole pine, and the one known occurrence of sweet grass. The Johnson Creek Route Alternative would impact 108.4 acres of occupied whitebark pine habitat and remove 767 individual trees of which 23 would be mature and cone-bearing. The one known occurrence of bitterroot, located in the transmission line corridor, could be indirectly impacted during construction of the transmission line upgrade the same as the 2021 MMP. The impact would be localized, long term, and negligible to moderate. While offsite presence of plants means the impact to overall access to a specific type of plant would be negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Noxious Weeds and Invasive Species**

Impacts from noxious weeds and invasive species would be similar to that discussed under the 2021 MMP. Since the Burntlog Route would not be constructed, there would be no potential for the SGP to introduce noxious weeds and invasive species along that route. The increased threat of weed infestation at and near the SGP would be a localized, long term, and negligible to minor impact to tribal use of vegetation.

**Wildlife**

Impacts to wildlife under the Johnson Creek Alternative would be similar to those described under the 2021 MMP. Under this alternative, the Burntlog Route would not be constructed, therefore there would not be the associated habitat fragmentation or wildlife displacement along that route, lessening impacts. This would shift disturbance away from the FCRNRW area where gray wolf packs are known to occur. Impacts would be localized, short term to permanent, and minor to moderate. There would not be any effects to the availability or populations of game species that would affect tribal hunting rights, except for a slight decrease in the amount of land available for tribal hunting due to restricted access in the Operations Area Boundary.
**Treaty Rights Access**

Impacts to treaty rights access would be the same as discussed under the 2021 MMP, except the Burntlog Route would not be constructed; therefore, there would be no change in treaty rights access in that area. Impacts along Johnson Creek Road and Stibnite Road would be long term as opposed to short term under the 2021 MMP. While offsite presence of tribal resources means the impact to overall fishing, hunting, pasturing, and gathering access would be negligible to minor, this would still constitute a localized, long-term, and moderate to major impact to tribal treaty rights specific to those tribal resources in their specific locations including those associated with potential historic properties, sacred sites or places, TCPs, and CLs. In consultations with the Tribes, they noted that any loss of treaty rights is significant to them and could potentially affect all tribal members. The Tribes would not be able to exercise treaty rights in the Operations Area Boundary for the life of the SGP, which would be a localized, long-term, moderate to major impact on tribal treaty rights.

**Noise**

Noise impacts would be similar to those described under the 2021 MMP except that the Burntlog Route would not be constructed therefore, there would be no construction, road maintenance, or traffic noise in that area. Noise impacts along the Johnson Creek Route related to the SGP would continue through closure and reclamation. Overall, noise impacts would be localized, temporary to long term, and negligible to moderate for tribal resources (i.e., wildlife), tribal treaty rights and traditional use experiences, and solitude including aspects associated with potential historic properties, sacred sites or places, TCPs, and CLs within the Operations Area Boundary and along the Johnson Creek Route.

**Visual Resources**

Visual impacts at the mine site would be the same as described under the 2021 MMP. Since the Burntlog Route would not be constructed, there would be no visual impacts related to that route. This area near the FCRNRW would retain its scenic integrity. The Johnson Creek Route would be widened and improved to accommodate operations traffic but generally would not cause additional changes to the landscape. During construction and operations, those areas adjacent to the Operations Area Boundary where these changes could be seen from traditional use or ceremonial sites, these visual contrasts would be a localized, long-term, and negligible to major impact to tribal treaty rights and traditional use experiences including those associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Recreation**

Impacts to tribal recreation would be the same as discussed under the 2021 MMP, except SGP-related traffic impacts would be long term along the Johnson Creek Route, as this route would be used during construction, operations, closure, and reclamation. Recreation impacts to the Tribes would be localized, temporary to permanent, and negligible to major including practices associated with potential historic properties, sacred sites or places, TCPs, and CLs.

**Air Quality**

Impacts to air quality would generally be the same as discussed under the 2021 MMP. Impacts to tribal treaty rights and tribal resources associated with potential historic properties, sacred sites or places, TCPs, and CLs due to haze would be localized, long term, and negligible to minor.
Socioeconomics

Socioeconomic impacts would be similar to that discussed under the 2021 MMP. Usage of the Johnson Creek Route through construction, operations, closure, and reclamation would increase traffic and activity for the long term (20+ years). Usage of the Johnson Creek Route for the duration of the SGP would increase traffic and activity on an existing roadway along portions of Johnson Creek Road where the Johnson Creek Artificial Propagation Enhancement fisheries restoration program is active. The socioeconomic components for the fisheries restoration program (e.g., road access, employment) would observe long-term, negligible to minor effects from the increased use of the Johnson Creek Route during construction, operations, reclamation, and closure of the SGP.

Environmental Justice

Environmental justice impacts would be similar to those discussed under the 2021 MMP; the potential for any adverse and disproportionate SGP-related impacts to the tribal environmental justice communities are expected to be limited to changes in tribal member access and subsistence or traditional use of the lands for the SGP mine area. However, the Burntlog Route itself would not be constructed and mine operations would continue to use the Johnson Creek Route for access. Upgrades to the Johnson Creek Route and its use as the access route to the mine site during operations would have the potential for impacts to tribal resources along this route due to increased noise, traffic, and potential sedimentation in Johnson Creek affecting water quality, fisheries, and displacement of wildlife for the life of the SGP. Tribal members may avoid these areas for a longer period of time. Therefore, impacts to subsistence resource availability under the Johnson Creek Route Alternative on tribal communities with environmental justice concerns would be localized, long term to permanent, and moderate.

4.24.3 Mitigation Measures

Mitigation measures required by the Forest Service would represent reasonable and effective means to reduce the impacts identified in the previous section or to reduce uncertainty regarding the forecasting of impacts into the future. These mitigation measures are in addition to the Forest Service requirements and EDFs (Section 2.4.9) accounted for in the preceding impact analysis. At this time, no mitigation measures have been identified for Tribal Rights and Interests. Mitigation measures may be added, revised, or refined based on public comment, agency comment, or continued discussions with Perpetua regarding this analysis. The adopted mitigation measures will be finalized in the Final EIS.

4.24.4 Irreversible and Irretrievable Commitments of Public Resources

The destruction of tribal resources, including subsistence resources, gathering areas, sacred sites or places, TCPs, or CLs, is a permanent and irreversible effect. They are generally non-renewable resources that continue to be important to, used by, and relied upon by the Tribes with interest in the area. If tribal treaty rights are disrupted by restricted access due to implementation of the SGP, these uses become unavailable. If traditional use areas and subsistence resources become no longer viable and/or unavailable for use for the foreseeable future by Tribes with rights in the SGP area this would constitute an irretrievable commitment of resources.
4.24.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not occur. Consequently, there would be no project-related irreversible or irretrievable commitment of resources as it relates to tribal rights and interests.

4.24.4.2 Action Alternatives

The consequences associated with irreversible and irretrievable commitments may include significant loss of tribally significant resources and the inability of tribal members to utilize traditionally important resources or access traditionally important places. Specific consequences would be identified through government-to-government consultation.

Traditionally collected or used natural resources of interest to the Tribes as reserved in treaties that could be destroyed by the Action Alternatives and constitute an irreversible commitment, regardless of mitigation. Many of these natural resources, such as salmon, plant populations, and trees, are only renewable over long periods of time. Other traditional use areas, such as usual and accustomed fishing places, TCPs, CLs, or sacred sites or places, that could be destroyed or otherwise altered by the Action Alternatives are often non-renewable, particularly if they are landscape features. Once gone, the resources are no longer available for use by the Tribes with rights and interests in the area.

Under the 2021 MMP, the restriction of public access in the Operations Area Boundary would remove the land from other uses while the mine is in operation, but the use would eventually be reversed through removal of the exclusion area and reclamation.

Implementation of the Action Alternatives could result in irretrievable and irreversible commitment of tribal treaty rights and interests if avoidance measures are not implemented, and access restrictions are enforced. For example, prohibiting use of a culturally important area, such as usual and accustomed fishing places, or a sacred site or a cultural or religious TCP District that is a historic property eligible for listing, for 20 years over the life of the SGP could result in the irretrievable and irreversible loss of cultural practices and identity to a generation of tribal members.

4.24.5 Short-term Uses versus Long-term Productivity

The resilience of tribal resources or tribal interests is very low in comparison to other social or biological resources because actions associated with the SGP (i.e., ground disturbance) that may affect tribal resources, subsistence and gathering areas, usual and accustomed fishing places, historic properties, TCPs, CLs, and sacred sites or places would be irreversible. Short-term uses, even uses such as temporary staging areas for transmission line construction or access roads that would later be returned to their pre-construction state, have the potential to permanently impact tribal resources and use areas of importance to the Tribes. There is the potential for the loss of long-term productivity to any tribal resources subjected to short-term use. The long-term productivity would be damaged due to the length of time of the SGP. Tribes and tribal members would be restricted from accessing their tribal resources within the Operations Area Boundary for a period of 20 or more years potentially impacting their tribal treaty rights.
4.24.5.1  No Action Alternative

Under the No Action Alternative, there would be no project-related short-term use that would affect tribal rights and interests, and no effect on long-term productivity.

4.24.5.2  Action Alternatives

Under the Action Alternatives, all short-term direct impacts to tribal resources and interests including usual and accustomed fishing places, would lead to a loss of long-term productivity. Some short-term protection measures could lead to long-term productivity (use of more tribal resource subsistence or gathering areas following mine closure) of resources. If tribal harvest areas, sacred sites or places, TCPs or CLs are identified, short-term use may be denied while protecting long-term productivity.
5.0 CUMULATIVE EFFECTS

5.1 Introduction

Cumulative effects are those impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (RFFAs) within the cumulative effects analysis areas (CEAs). They can result from individually minor, but collectively significant actions taken over a period of time. Major past and present land uses in the CEAs, which are projected to continue into the future include: mining, roads/trails, timber harvesting, wildfires, fisheries restoration, and exercise of Tribal Treaty Rights. Dispersed recreation (including hunting, fishing, float boating) and residential development also occur in parts of the CEAs.

Guidance from CEQ, “Considering Cumulative Effects – January 1997,” was used in identifying geographic boundaries and ultimately the CEA for each resource. The CEA for each environmental resource is presented in Table 5.1-1 and discussed under the specific resource subsection.

5.1.1 Cumulative Effects Areas

Past, present, and RFFAs include activities, developments, or events that have the potential to change the physical, social, economic, and/or biological nature of a specified area. Existing and projected activities directly associated with past and present activities, and other RFFAs, provide the basis for defining and analyzing cumulative impacts. A cumulative effect overlaps in space and time with the direct and indirect effects of the action.

Due to the nature of the SGP that requires many miles of transmission line and roads, the direct and indirect effects areas are expansive. However, the effects themselves are not expansive. Therefore, the analysis of cumulative effects does not result in a broader analysis area for most resources. Table 5.1-1 presents the CEAs by resource and the associated figure number.

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<td>All of the watercourses and waterbodies in the HUC 6th field (10-digit code) watersheds that overlap potential SGP disturbance areas. SFSR hydrological subbasin and the North Fork Payette River hydrological subbasin.</td>
<td>Figure 3.12-1</td>
</tr>
<tr>
<td>Wildlife and Wildlife Habitat including TEPC Species</td>
<td>The wildlife 6th-level HUC at the 12-digit scale (HUC 12) subwatershed boundaries.</td>
<td>Figure 3.13-1</td>
</tr>
<tr>
<td>Timber Resources</td>
<td>The PNF and BNF, as well as any commercial timberlands in Valley County.</td>
<td>Figure 3.14-1</td>
</tr>
<tr>
<td>Land Use and Land Management</td>
<td>The SGP components including the mine site and access roads, utilities, and offsite facilities.</td>
<td>Figure 3.15-1</td>
</tr>
<tr>
<td>Access and Transportation</td>
<td>The overall road system encompassing the SGP components.</td>
<td>Figure 3.16-1</td>
</tr>
<tr>
<td>Heritage Resources</td>
<td>The VAV APE.</td>
<td>Figure 3.17-1</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Valley County, particularly the residents of the village of Yellow Pine, the nearest residential community to the mine site area, as well as recreational visitors who frequent the area.</td>
<td>No Figure</td>
</tr>
<tr>
<td>Recreation</td>
<td>A 5-mile radius from the SGP components to account for where the SGP could be visible within foreground or middle ground distances and noise from SGP activities could be audible and thus could potentially affect recreation opportunities and settings.</td>
<td>Figure 3.19-1</td>
</tr>
<tr>
<td>Scenic Resources</td>
<td>NFS lands in Valley and Adams Counties.</td>
<td>Figure 3.20-1</td>
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<tr>
<td>Social and Economic Conditions</td>
<td>Valley and Adams Counties.</td>
<td>Figure 3.21-1</td>
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<tr>
<td>Environmental Justice</td>
<td>Valley and Adams Counties and Native American Tribes whose traditional subsistence range includes the mine site.</td>
<td>Figure 3.22-1</td>
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<tr>
<td>Special Designations</td>
<td>All WSR waterways in the watershed. IRAs and RNAs within 5 miles of SGP facilities.</td>
<td>Figures 3.23-1 through 3.23-4</td>
</tr>
<tr>
<td>Tribal Rights and Interests</td>
<td>Lands administered by the PNF and BNF, and other federal, state, and private lands within and adjacent to these National Forests.</td>
<td>No Figure</td>
</tr>
</tbody>
</table>
5.1.2 Past and Present Actions

Past actions include activities that may have been initiated in the past but may have lingering effects in impacting the environment or may influence trends in the physical, biological, or social environment.

Present actions include other mining projects and their related activities (i.e., exploration, reclamation) that are currently underway and are causing impacts. They also may include other non-mining related projects currently in progress, such as timber sales or vegetation treatment; tribal fisheries restoration activities; recreation; other utility lines (e.g., powerlines) and roads; maintenance and use of the existing transportation network; urban development in Valley County; private land development and uses; and sand and gravel extraction.

Past and present actions that have an interactive, synergistic, and/or additive effect (per 40 CFR 1508.7) with a specific resource (such as lingering effects or influencing trends) in the SGP area are described below:

**Mineral Exploration and Mining Activities** – Past and present mineral exploration and mining have occurred in the vicinity of the SGP, including prospecting, exploration, underground mining, and open pit mining. To support past mining, other related activities occurred at or near the SGP site, including ore milling and processing, tailings disposal, smelting, heap leaching of ore, spent heap leach ore disposal, development rock disposal, hydropower generation, water retention dam construction, sawmill operations, electric power transmission line construction, and occupancy by thousands of people in housing camps and later in the town of Stibnite.

The past mining, milling, and processing activities created numerous legacy impacts including underground mine workings, multiple open pits, development rock dumps, tailings deposits, heap leach pads, spent heap leach ore piles, a mill and smelter site, three town sites, camp sites, a ruptured water dam (with its associated erosion and downstream sedimentation), haul roads, an abandoned water diversion tunnel, and an airstrip.

Other past and/or present mining projects considered in the cumulative effects analysis include:

- **Fourth of July Mine** – Located in Government Creek on NFS land, Fourth of July Mine has been inactive (Forest Service 2012d).

- **Camp Bird Mine** – Located in Logan Creek on private land, Camp Bird Mine has been inactive for more than 30 years (Forest Service 2012d).

- **Valley County Quarry Development** – Development and operation of an aggregate source to support the road maintenance activities on McCall-Stibnite Road (CR 50-412), Johnson Creek Road (CR 10-413), and other backcountry roads as determined by Valley County (Forest Service 2017g).

- **Walker Millsite** – Located in Logan Creek on private land, the plan of operations approved in 1990 included a 50 ton per day ball mill and gravity milling process with the following components: a 50-foot by 100-foot by 8-foot-deep tailings impoundment, 1,000 feet of access...
road, a water transmission line, and explosives magazine. The millsite on NFS land has been reclaimed (Forest Service 2012d).

- Golden Hand No. 1 and No. 2 Lode Mining Claims – Located in the Big Creek drainage on 1,309 acres of NFS land, approximately 19 miles north of Yellow Pine, the plan of operations included drilling operations, trenching and sampling, and reopening the caved Ella Mine adit. The project also would include the collection of subsurface geological information to prepare for a new mineral examination. The claims encompass approximately 20 acres each and are adjacent to Coin Creek (Forest Service 2012d).

- Cinnabar Mine – Located 15 miles east of Yellow Pine and approximately 50 acres in extent, most of the mining occurred during the 1950s. No reclamation has been performed at the site and contaminants of concern include mercury, methylmercury, and arsenic (EPA 2020).

Exploration activities for potential future mining development have been occurring for the last decade and are ongoing at or within the vicinity of the SGP. Affiliates of Midas Gold initiated mineral exploration activities in 2009 as part of the Golden Meadows Exploration Project to better define the mineral deposit potential for the area. Activities associated with the Golden Meadows Exploration Project included the use of the existing road network, and construction of several temporary roads to access drill sites, drill pad construction, drilling on both NFS and private lands, and reclamation (Forest Service 2015). The following is a brief summary of the activities:

- Midas Gold Exploratory Drilling (2009-2012) – Exploratory drilling consisting of approximately 6 to 122 drill pads mostly occurred on private land. Crews were housed on private property in Yellow Pine. All equipment was staged on private property and drilling activities generally occurred 24 hours per day. Water withdrawal sites included existing sediment retention ponds and streams. Private and Forest Service temporary roads were used and/or authorized to access drill pads located on NFS lands. Road maintenance was needed to open the existing roads. For winter activities, chained rubber-tired vehicle, helicopter, snowcat, or snowmobile provided access. Where drill pads were located next to roads, some snow plowing occurred at select locations. During snow-free periods, access occurred by helicopter, and where there was authorized access on NFS land or on private land, rubber-tired vehicles also were used for access. Midas Gold also drilled 16 new groundwater alluvial and bedrock monitoring wells on 8 pads in 2012 (Forest Service 2015).

- Monitoring Wells for the Golden Meadows Project (2013) – Midas Gold drilled four new groundwater alluvial and bedrock monitoring wells on two pads in 2013. Exploration drilling was conducted in 26 drill areas within NFS land. Twenty-four of the drill areas were accessed by helicopter (i.e., for transport of equipment and crew) and contained temporary helicopter-supported drill pads. No temporary roads were needed for these 24 drill sites (Forest Service 2015).

- Midas Gold Baseline Studies (2013-2017) – Baseline data collection studies including water quality, fishery surveys, wildlife surveys, and vegetation mapping were conducted (Forest Service 2015).
• Winter Geotechnical Study (2017) – Exploration drilling was conducted in 26 drill locations within NFS land. Twenty-four of the drill sites were accessed by helicopter (i.e., for transport of equipment and crew) and contain temporary helicopter-supported drill pads (Forest Service 2015).

• Geotechnical Studies along Meadow Creek (2017) – Geotechnical study field work program was conducted in support of feasibility level engineering work on the proposed tailings impoundment and impoundment dam foundation conditions. Midas Gold utilized a track mounted Cone-Penetrometer Test rig to access eight locations along Meadow Creek in September/October 2017 (Forest Service 2015).

• Operations Exploratory Drilling (2016-2019) – In addition to exploratory drilling for the winter geotechnical study in 2017, expansion of an existing borrow source on NFS land just east of the camp and shop area also occurred. The borrow material supplied approximately 7,000 cubic yards of crushed rock to support the exploration program, including road maintenance and site reclamation activities and also was used by previous operators and the Forest Service. Approximately 141,000 gallons of fuel (diesel, gasoline, and jet fuel) per calendar year was transported on existing Valley County roads to the fuel storage facility (located on private land) (Forest Service 2015).

• Exploration and Geotechnical Drilling (2018) – Midas Gold drilled 62 exploration and geotechnical drilling pads within the project area. Fifty-six of the pads were track-supported and the remaining six were helicopter-supported. The 62 proposed pads are located in the vicinities of the following water bodies: Upper East Fork SFSR, Meadow Creek, Middle East Fork SFSR, Lower East Fork SFSR, Upper Meadow Creek, and West End Creek (HDR 2017p).

• On-going Monitoring for Golden Meadows Project – Monitoring for weeds, water quality, minerals and geology, access and haul route water quality monitoring, monitoring of water quality best management practices and project standard operating procedures associated with haul and access road use, wildlife and rare plants continue to be conducted (Forest Service 2015).

• Burntlog Route Geophysical Investigation Field Work (2020-2021) – Midas Gold (now Perpetua) collected geophysical data at proposed rock quarries, bridge abutments, cut slopes, and soil nail/mechanically stabilized earth wall locations using four methods including a Dynamic Cone Penetrometer Test, a track mounted excavator, a truck/track mounted hollow stem auger/core rig, and a helicopter assisted casing advance/core drill rig. Perpetua is investigating 24 locations by drilling or excavating 40 borings/test pits along the proposed Burntlog Route (Midas Gold 2019e).

Transportation Projects – Road maintenance, improvement projects, airstrip operations and maintenance, and culvert and bridge replacements have occurred in the past and are expected to continue in the future. Installation or improvement of culverts and bridges may impact aquatic habitat due to construction-related effects and erosion. Maintenance of existing roadways, culverts, and bridges will likely be short-term, while new roadways, culverts, and bridges would have a larger effect. More information regarding current and future road maintenance and airstrip operations are provided below:
• Road Maintenance of NFS Roads – Thunder Mountain Road (FR 50375) and Meadow Creek Lookout Road (FR 51290) are both NFS maintenance Level 2 roads that received maintenance in 2014 and are on a regular maintenance schedule. Road maintenance activities include blading, slough removal, and culvert cleaning. It is assumed that private landowners on private lands keep roads open and maintained to meet their needs.

• Road Maintenance of County Roads – Warren Profile Gap Road (CR 50-340) and the road to the Big Creek Trailhead are currently maintained by Valley County under a cooperative agreement; both roads are on an annual or biannual maintenance schedule. Road maintenance activities include blading, slough removal, and culvert cleaning. Smith Creek and Pueblo Summit Roads have not received any maintenance for years (Forest Service 2016i).

• McCall-Stibnite Road (CR 50-412) is currently maintained on a regular maintenance schedule by Valley County under a cooperative agreement. There is an agreement between Valley County and Perpetua to allow Perpetua to provide maintenance along the road from Yellow Pine to Perpetua's property.

• Road Maintenance of State Roads – SH 55 is maintained by the ITD. Recent upgrades and improvements included the Banks Beach parking study and the ongoing Smiths Ferry safety improvements. SH 55 was recently repaved between Donnelly and McCall (ITD 2021). The project addressed wear and tear to increase the service life of the roadway.

• The ITD, Division of Aeronautics maintains and operates the Johnson Creek, Warm Springs, and Bruce Meadows airstrips which are located on NFS land.

Mine Closure and Reclamation – Closure and reclamation of Hecla and SMI mining and processing facilities located in the headwaters of East Fork SFSR and Sugar Creek occurred between 1993 and 2000. Several CERCLA Removal Actions also were conducted in the same area by the Forest Service, EPA, and Exxon-Mobil Corporation to minimize risks to human health and the environment from legacy mining and processing activities during the 1930s, 40s, and 50s.

Recreation and Tourism – Past and present recreation and tourism activities include sport hunting, fishing, trapping, boating and river recreation, bike races, OHV use, camping, hiking, backpacking, outfitter/guide operations, tourist services – Big Creek Lodge, Elk Springs Outfitters, and Juniper Mountain Outfitters. These activities take place primarily from late spring to late fall, and there may be small plane, helicopter, and vehicle traffic associated with access. OSV use, skiing, and snowshoeing occur in winter months. Some of the OSV routes are groomed for use.

Infrastructure Development – Past and present community infrastructure projects include the transmission line upgrades in the West Central Mountain Electric Plan 2014, which follows the general location of the SGP upgraded transmission line route (IPCo 2014). In 2020, IPCo rerouted approximately 2.5 miles of the existing Warm Lake Feeder overhead 7.2kV distribution line with approximately 2.75 miles of single-phase underground line in the Yellow Pine area (Forest Service 2020j).
**Water Diversions and Hydro Power Projects** – There are eight water diversions on federal and private lands in vicinity of the SGP area. There also are three residential, small-scale hydroelectric operations (0.4 to 0.9 cubic feet per second permitted), and one hydroelectric operation at Big Creek Lodge.

**Wildland Fire, Noxious Weed Control, and Firewood Harvest** – There have been numerous wildland fires in vicinity of the SGP area and more could occur in the future. Past fires within the headwaters of the East Fork SFSR and Sugar Creek include Indian Creek Point (12,204 acres); Tamarack (2,348 acres); Bishop Creek (2,610 acres); Cascade Complex (299,930 acres); Thunder City (13,263 acres), and Buck Fire (19,474 acres). In fall of 2021, the Krassel Ranger District conducted prescribed burns to areas east of Yellow Pine (Bald Hill project area) and along the SFSR (Four Mile project areas). Removal of firewood for non-commercial use has occurred in the past and is expected to continue in the future on NFS land, in compliance with general permit requirements for the PNF.

Authorized in May 2021, the Big Creek Hazardous Fuel Reduction was a community protection project for Edwardsburg/Big Creek area using commercial and noncommercial treatments and prescription fire to reduce hazardous fuels. Treatments were on NFS lands along public roads and adjacent to private property, outside of wilderness. The project implementation reduced wildfire risk and fire severity/intensity on NFS lands around Big Creek and Edwardsburg and private property using commercial timber harvest, understory treatment, and prescribed burning. Approximately 10,290 acres were treated including, approximately 631 acres of mastication and/or hand thin, no removal; 847 acres of commercial and pre-commercial thinning; 1,047 acres of hand-thinning, no removal; 7,765 acres of natural fuel prescribed fire burn blocks; and less than 1 mile of temporary road constructed to facilitate equipment access and product removal reclaimed after vegetation management treatments were completed.

Several noxious weed species have been identified in the vicinity of the SGP including spotted knapweed, Canada thistle, yellow toadflax, and rush skeletonweed. Treatment of noxious weeds occurs regularly throughout the area. Treatments include chemical spraying and pulling. Main areas of treatment for noxious weeds include Chamberlain area, Beaver Creek, and Big Creek trails, and along road access areas. The Lost Horse vegetation management project was completed within the Clear Creek drainage along FRs 405, 406, 407, 409, and 433; the objective of this project was to restore species composition and stand structure while reducing undesirable tree densities and favoring retention of larger diameter, more fire-resistant trees (Forest Service 2020j).

**Forest Management** - These activities include easements and other management actions. There are several easements in the SGP area and vicinity that are granted and maintained by the Forest Service including: Road ROW, FRTA on McCall-Stibnite Road (CR 50-412), Road ROW and Linear Utility easement to the IPCo. The Yellow Pine Blowdown Project near Yellow Pine was conducted to remove down material from camping and recreating areas, reduce the risk of insect outbreak, and to reduce the fuel loading to help to ensure the safety of the Yellow Pine community. In 2020, the BNF decommissioned approximately 18 miles of non-system routes in the Six-bit Creek and Curtis Creek subwatersheds, part of the SFSR subbasin (Forest Service 2020j).

The South Fork Restoration and Access Management Plan (RAMP) is in the implementation phase with the decision dated July 13, 2021. The project’s objective is to determine the minimum road system,
improve watershed condition, provide ATV and motorcycle trail opportunities, and provide dispersed camping and parking opportunities. The project includes numerous actions relating to watershed restoration, motorized and non-motorized access, and improvements of recreation facilities within the SFSR watershed within a 329,000-acre project area. Target dates for implementation are 2022-2027 (Forest Service 2021a).

Fisheries Restoration – The Nez Perce Tribe began the Johnson Creek Artificial Propagation Enhancement Project in 1998 in response to critically low numbers of returning adult Chinook salmon to Johnson Creek (Columbia River Inter-Tribal Fish Commission 2018). The program uses only natural-origin returns for broodstock, and currently has an annual target release level of 100,000 yearling smolts into Johnson Creek (NMFS 2016).

Further, the Nez Perce Tribe and IDFG translocated adult Chinook salmon from the SFSR to Meadow Creek, but not as part of the Johnson Creek Artificial Propagation Enhancement Project. Since 2008, Chinook salmon spawners were released into Meadow Creek most years. Spawning-ready adult Chinook salmon are periodically translocated from the SFSR to upstream of the Yellow Pine pit lake barrier with support from the Nez Perce Tribe.

Commercial and Subsistence Harvest of Fish and Wildlife – Past and present harvest of fish and wildlife for recreational and subsistence purposes puts some degree of pressure on those resources. Legal hunting, fishing, and trapping has occurred and is currently occurring in the SGP area and vicinity. Fish and wildlife resources are managed by the IDFG and federal agencies to maintain sustainable populations. Managers use management tools such as harvest limits and areas open and closed to sport and commercial harvest of fish and wildlife to maintain sustainable resources and allocate harvest.

5.1.3 Reasonably Foreseeable Future Actions

Table 5.1-2 describes RFFAs in the CEAs.

Table 5.1-2 RFFAs in the Vicinity of the SGP Area

<table>
<thead>
<tr>
<th>Project or Activity Name</th>
<th>Agency Document/District</th>
<th>Brief Description</th>
<th>Approximate Implementation/Construction/Operation Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stibnite Mine Site ASAOC</td>
<td>EPA and Forest Service ASAOC</td>
<td>In Phase 1, address legacy mining impacts, including time critical removal actions consisting of stream diversion ditches and removal of about 325,000 tons of development rock and tailings.</td>
<td>2022-2024</td>
</tr>
<tr>
<td>East Fork RAMP SOPA</td>
<td>EA/PNF</td>
<td>Scoping for the East Fork RAMP estimated to start late 2021. The spatial extent of the East Fork RAMP could include Yellow Pine, Big Creek, and Thunder Mountain within the PNF. The purpose of the East Fork RAMP is travel management. The Forest Service would conduct travel planning to identify a Minimum Road System (MRS) (36 CFR 212 Subpart A) and the routes open for public use (36 CFR 212 Subpart B), including motorized trail opportunities, dispersed camping, and parking</td>
<td>Expected Decision: 04/2023 Expected Implementation: 05/2023</td>
</tr>
<tr>
<td>Project or Activity Name</td>
<td>Agency Document/ District</td>
<td>Brief Description</td>
<td>Approximate Implementation/ Construction/ Operation Dates</td>
</tr>
<tr>
<td>-----------------------------------------</td>
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</tr>
<tr>
<td>Granite Meadows</td>
<td>EIS/PNF SOPA</td>
<td>This project is part of the forest’s Collaborative Forest Landscape Restoration Program. The project includes vegetation, watershed, transportation, and recreation management activities.</td>
<td>On hold</td>
</tr>
<tr>
<td>Burntlog Route Geophysical Investigation</td>
<td>CE/BNF SOPA</td>
<td>The purpose of the investigation is to collect geophysical data along the existing Burnt Log Road and proposed new alignment between Trapper Creek and Stibnite.</td>
<td>This project is currently on hold.</td>
</tr>
<tr>
<td>Wildlife Conservation Strategy</td>
<td>EIS (Forest Plan Amendment) 101 PNF SOPA</td>
<td>Short- and long-term management strategies and priorities for maintaining and restoring habitats associated with terrestrial wildlife species.</td>
<td>On hold</td>
</tr>
<tr>
<td>Nez Perce Tribe Research Equipment</td>
<td>CE/PNF SOPA</td>
<td>Replacement of an existing propane tank servicing a fish detection system (PIT array) with a 1,000-gallon tank in an existing hardened area to ensure fuel supply through winter months.</td>
<td>Scoping initiation: 11/2021 Expected Decision: 05/2022 Expected Implementation: 06/2022</td>
</tr>
<tr>
<td>Stallion Gold – Horse Heaven Project</td>
<td></td>
<td>Surface exploration of gold and antimony deposits. The project consists of 695 unpatented federal mining claims and mineral rights on 13,950 acres. This project would share its eastern boundary with the SGP.</td>
<td></td>
</tr>
<tr>
<td>South Fork Plunge Watershed Restoration</td>
<td>CE / BNF SOPA</td>
<td>The project would decommission NFSR 490; remove old bridge, abutments, and road fill from the active floodplain of the SFSR.</td>
<td>06/2023</td>
</tr>
</tbody>
</table>


CE = Categorical Exemption; EA = Environmental Assessment; EIS = Environmental Impact Statement; SOPA = Schedule of Proposed Actions

5.2 Geologic Resources and Geotechnical Hazards

The CEA for geologic resources and geotechnical hazards that could be directly or indirectly affected by the SGP encompasses the direct and indirect impact analysis area, which is the footprint of disturbance of all SGP components, and extends out to the sixth-level HUC at the 12-digit scale (HUC 12) subwatershed boundaries (Figure 3.8-1); HUCs used in this analysis are local subwatershed levels that encompass tributary stream systems where mine site activities that affect geology are proposed.

5.2.1 No Action Alternative

Under the No Action Alternative there would be no open-pit mining or ore processing at the mine site, or other supporting infrastructure corridors and facilities. The effects of past mining activities and their
current geological/geotechnical conditions (e.g., alteration of topography/ridgelines, the presence of the Yellow Pine pit and current condition of the adjacent highwall slopes, reclaimed areas, etc.) would remain. Under the No Action Alternative, Perpetua could continue to implement the proposed actions included in the applicable Golden Meadows Exploration Project Plan of Operations and EA (Forest Service 2015), and the exploration and subsequent reclamation activities would have an insignificant direct effect to geology/soils and therefore an insignificant cumulative contribution.

Phase 1 of the ASAOC includes removal of tailings and other mining wastes from the stream channels of lower Meadow Creek and East Fork SFSR and placing the excavated wastes in selected, on-site locations where they would no longer impact water quality in these streams. It also includes construction of three stream diversions to avoid contact of runoff with legacy mining wastes.

5.2.2 Action Alternatives

Cumulative effects associated with the 2021 MMP and Johnson Creek Route Alternative consider the range of existing and foreseeable activities and their potential effects with respect to geologic resources and geotechnical hazards. Potential effects to geologic resources and geotechnical hazards consist of mineral resource depletion, topographic changes, and geotechnical instability. Past and present actions that have, or are currently, affecting geologic resources and geotechnical hazards include mineral exploration and mining activities, infrastructure and road development, and previous road construction or upgrades within the CEA.

Both action alternatives would have the same permanent impact on ore reserves in the CEA, which would combine with the impacts of past mining activities such as from Valley County Quarry Development, Fourth of July Mine, Camp Bird Mine, etc., that also have depleted ore reserves in this part of Idaho, as well as combine with any future mine operations in the region, such as the Horse Heaven Project, which would further deplete ore reserves. The contribution of either action alternative to this cumulative impact would deplete an additional approximately 115 million tons of ore, the volume of ore proposed to be extracted under the 2021 MMP and Johnson Creek Route Alternative.

Both action alternatives would increase risks from mass wasting hazards by introducing additional personnel and equipment into existing hazard areas. Geohazards and seismic conditions are site-specific, as individual project sites would be geologically removed from one another. A few of the RFFAs (e.g., mineral exploration and mining associated with Golden Hand No. 3, 4, and 8, Big Creek Fuels Reduction Project, Morgan Ridge Exploration Project, Dewey Mine Sediment Stabilization Project, Horse Heaven Project) have the potential to increase traffic on Stibnite Road (CR 50-412) to access their respective project sites. Although Stibnite Road has an existing avalanche hazard (i.e., is located at the bottom of avalanche runout zones) that could impact travel along the road, use of this road by the SGP and by RFFAs would not exacerbate the existing avalanche occurrence, but it would add additional personnel on this road, which would increase the risk of damage, injury, or loss of life from the hazard.

Geohazards and seismic conditions are site-specific, as individual project sites would be geologically removed from one another. As such, the RFFAs would not increase risks associated with geotechnical hazards.
By their nature, impacts on geologic resources and geotechnical hazards are geographically isolated and not interdependent within the area. Therefore, while individual impacts are measurable, the cumulative effects are still considered to be limited given the spatially-separated nature of disturbance over the region.

### 5.3 Air Quality

With respect to air quality, activities directly associated with the SGP and other RFFAs having air pollutant emissions at a level that cause overlap with SGP-related effects in time and location, would result in cumulative impacts. The air quality cumulative effects analysis considers the potential contributions of actions that could occur in the relatively large analysis area. The CEA for air quality is generally the same as the larger far-field region (Figure 3.3-2).

#### 5.3.1 No Action Alternative

For the No Action Alternative, the nature and extent of cumulative effects is represented by the current air quality conditions in the CEA. Ambient air data for CO, NO2, SO2, and on-site data for PM10 and PM2.5 are available to serve as quantitative indicators for the impacts from current non-SGP sources on air quality. These background ambient air measurements offer the best indication of cumulative effects due to current emissions sources, absent the SGP. The monitored baseline values used for the air quality impact assessment were obtained at locations that are more developed than the SGP area. By comparison, the cumulative effects in the analysis area due to the current activities and air emission sources would be minor.

The federal agencies entered into an ASAOC with Midas Gold (now Perpetua) in January 2021 for the cleanup of certain legacy mining wastes in the SGP area. The work would involve excavating the wastes out of certain portions of Meadow Creek and East Fork SFSR and then relocating those wastes to more suitable locations on site. This work is scheduled for the construction seasons in 2022-2024 and would involve excavation and hauling equipment as well as other vehicles for personnel and fuel/supplies transportation on the current access roads to the area. This would produce dust and tailpipe emissions that would likely precede the major construction activities of the action alternatives and so would not be cumulative to the air emissions from those activities.

#### 5.3.2 2021 MMP

For the far-field air quality impact analysis, a suitable far-field modeling domain was defined as an area 420 km by 420 km in extent, centered on the SGP, as shown in Figure 3.3-2. This area encompasses the closest Class I areas and Class II wilderness areas that are most likely to have impacts. The four Class I areas for which far-field modeling results were reported are SAWT, SELW, HECA, and CRMO.

Cumulative effects analysis for air quality considers the geographic range and timeframe of impacts from past, current, and foreseeable activities. The air quality effects from past projects do not generate cumulative effects with current ones due to the transient nature of air quality conditions. Transport from far more distant urban regions, even overseas, may contribute to local air conditions (e.g., ozone) but are not in the scope of a cumulative effects analysis. Therefore, past operations by Perpetua in the SGP area, such as exploratory drilling, monitoring wells, and roadway construction and maintenance, are not
contributors to air quality cumulative effects. Similarly, past activities in the CEA, such as prior roadway and infrastructure construction projects, and timber and underbrush harvesting, would not have effects that overlap in time with the SGP emissions, and therefore would not contribute to air quality cumulative effects.

The ambient air data for CO, NO₂, SO₂, and on-site data for PM₁₀ and PM₂.₅ indicate the existing impacts from off-site sources on air quality near the SGP area was reviewed for this analysis (Section 3.3). These background ambient air measurements offer the best indication of cumulative effects due to current emissions sources. Although some background measurements of ozone in the Boise urban area are above the NAAQS, the ozone baseline value for this assessment recommended by the IDEQ is compliant with the NAAQS. The monitored baseline values used for the SGP air quality impact assessment were obtained at locations that are more developed than the SGP area. By comparison, the cumulative effects in the analysis area due to current activities and air emission sources would be minor.

There are no other permitted sources of HAP emissions in the vicinity of the SGP area. One source, the Tamarack Mill, LLC is 75 miles from the SGP, and has reported minor source level emissions to IDEQ. The HAP emission inventory in the vicinity of the SGP area is unknown; however, given the absence of large HAP emission sources near the SGP area, it can be assumed that the baseline HAP cumulative effects are low.

Several reasonably foreseeable activities in the CEA that were considered regarding cumulative air quality effects are listed in Tables 5.3-1 and 5.3-2. The nature of the air emissions and contributions to potential cumulative effects are described for each project. Activities that are anticipated to have overlapping impacts with the SGP related to air quality include wildfires and Big Creek fuels reduction.

### Table 5.3-1 RFFAs Considered Regarding Cumulative Air Quality Effects for Specific Planning Projects

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Names/Description</th>
<th>Nature of Air Emissions and Contribution to Cumulative Effects</th>
</tr>
</thead>
</table>
| Roadway Development and Maintenance| • Big Creek Road Plan of Operations Project EA  
• Morgan Ridge Exploration Project – Access Road Plan  
• Such projects authorize the use of and/or improvement of roads to conduct exploration and development of locatable mineral claims | Dispersed short-term local emissions of road dust and vehicle tailpipe emissions. Negligible long-term cumulative air quality effects in combination with the SGP. |
| Exploratory Drilling for Mineral Resources | • Morgan Ridge Exploratory Drilling Plan of Operations EA  
• Project involves exploratory drilling for locatable minerals from remote drill pads approximately 10 miles north of the SGP. Project is reportedly on hold. | Local emissions from drilling equipment (e.g., compressor engines), road dust, and tailpipe emissions. The magnitude of emissions is not expected to be sufficient to have overlapping pollutant concentration effects at this distance from the SGP. |
<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Names/Description</th>
<th>Nature of Air Emissions and Contribution to Cumulative Effects</th>
</tr>
</thead>
</table>
| Forest Maintenance and Fire Risk Reduction | • Big Creek fuels reduction project approx. 10 miles north of the SGP  
• South Fork RAMP EA, 25 miles southwest of the SGP  
• Projects to reduce wildfire risk and fire severity/intensity on NFS lands and private property using commercial timber harvest, understory treatment, and prescribed burning | Local emissions from portable generator equipment (e.g., compressor engines, road dust, and tailpipe emissions. Particulate emissions from lumbering activities and hauling. The Big Creek project may be of sufficient magnitude to have overlapping PM concentration effects from the SGP. The South Fork project is of sufficient distance that it would have negligible cumulative air quality effects. |
| Construction Projects                    | • Creek remediation/restoration (ASAOC)  
• Trail construction and maintenance  
• Bridge and culvert replacement projects, generally located more than 10 miles north of the SGP area  
• Hydroelectric projects: small residential projects for power generation  
• Road maintenance                                                                                                                                  | Short-term emissions during construction with no long-term emission impacts that would likely overlap with impacts related to the SGP.                                                                                                                                                     |
| Natural Emission Events                  | • Wildland fires  
• Past fires with the headwaters of the East Fork SFSR and Sugar Creek include Indian Creek Point (12,204 acres); Tamarack (2,348 acres); Bishop Creek (2,610 acres); Cascade Complex (299,930 acres); Thunder City (13,263 acres), and Buck Fire (19,474 acres). In the fall of 2021, the Krassel Ranger District conducted prescribed burns to areas east of Yellow Pine (Bald Hill project area) and along the SF SR (Four Mile project areas). | Areas devoid of trees and vegetation may have potentially large, short-term air quality effects, due to increased windblown dust.                                                                                                                                                         |
| Mining Activities                         | • Ongoing mining activities on patented land.  
• Mineral exploration and mining have occurred in several locations around the SGP area.  
• Exploration activities area ongoing for potential future mining development.                                                                                                                | Local emissions from drilling equipment (e.g., compressor engines), road dust, and tailpipe emissions. Known mine operations are small in size (50 tpd or less) or are inactive. Locations of foreseeable projects with low emissions are at sufficient distances from the SGP to not contribute overlapping effects. |
### Project Type | Project Names/Description | Nature of Air Emissions and Contribution to Cumulative Effects
--- | --- | ---
Recreation and tourism | Recreation and Tourist activities: • Sport hunting, fishing, trapping • Snowmobile trails • Fugitive dust and tailpipe emissions from traffic on unpaved roads • Boating and river recreation • Camping, hiking, backpacking • Outfitter/Guide Operations • Tourist Services – Big Creek Lodge • Off-highway vehicle use • Tourist Services – e.g., Big Creek Lodge | Collectively air emissions from vehicles on unpaved roads and trails, boats, and stationary fuel combustion sources. Depending on the proximity of these activities to the SGP area, transient cumulative effects may occur.

Past and present actions that have influenced air quality are expected to continue, such as existing infrastructure operations, transportation modes, plus energy and utility development and upgrades. RFFAs in the CEA would likely induce little additional change to air quality, because large scale activities associated with RFFAs are speculative at this time. Overall, air emissions are expected to increase as a result of the SGP and the past, present, and future actions. However, these emissions would be regulated in accordance with State and federal air permitting requirements.

#### 5.3.3 Johnson Creek Route Alternative

Although the magnitude and location of SGP air emission sources related to access roads are different for the two action alternatives, the differences are not large enough to significantly change off-site air quality impacts. Consequently, the potential for cumulative air quality effects described above for the 2021 MMP would also apply to the Johnson Creek Route Alternative. The extent and magnitude of potential cumulative air quality effects due to foreseeable projects in the analysis area would be the same.

#### 5.4 Climate Change

In accordance with NEPA and the CEQ guidelines, cumulative effects are to be analyzed as a component of any project undergoing a NEPA analysis. RFFA emission sources directly associated with the alternatives, and RFFAs having emissions that may or may not overlap with the alternatives in time, could result in cumulative climate change impacts, even though it is not possible to quantify such incremental effects.

Regional levels of GHG emissions will change due to many factors, the primary ones being trends in industrial activity, pace of energy resource development, transportation fuel consumption rate, and population growth. But within this generalized framework, it cannot be predicted with certainty the extent to which the mix of all these activities will collectively contribute to the global phenomenon of climate change. However, cumulative regional emissions can be estimated by including SGP values to current and predicted future numbers. A specific regional impact directly from those emissions or sources would not be definitive because of the numerous other factors described above.
5.4.1 No Action Alternative

Under the No Action Alternative, the SGP would not be implemented and therefore would not contribute to cumulative climate effects. The same cumulative effects contributions from potential development in the surrounding area would be the same as described above.

Past and ongoing activities in the region surrounding the SGP area include forest management (e.g., prescribed burns), motorized use of roads for land management and recreation, and fire suppression. These activities would continue as GHG contributors in the context of the total GHG inventory for Idaho and would not be expected to add to substantial cumulative GHG-related effects in the region or to climate change in general. Table 5.4-1 describes the current and reasonably foreseeable activities that may affect cumulative GHG emissions.

Areas of the SGP disturbed by previous mining activities would remain as they are, except those identified in the ASAOC, and (without targeted revegetation efforts tied to required mine reclamation) would be anticipated to recover at a natural, although very slow, rate as new soil forms and plants are established.

Table 5.4-1 Current and RFFAs Considered Regarding Cumulative GHG Emissions

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Names/Description</th>
<th>Nature of Air Emissions and Contribution to Cumulative Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory Drilling for Mineral</td>
<td>• Morgan Ridge Exploratory Drilling.</td>
<td>Local GHG emissions from drilling equipment (e.g., compressor engines), and vehicle tailpipe emissions. Expected to have GHG emissions that are a very small portion of the Idaho inventory¹.</td>
</tr>
<tr>
<td>Resources</td>
<td>• Project involves exploratory drilling for locatable minerals from remote drill pads approximately 10 miles north of the SGP. Project is reportedly on hold.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Horse Heaven Project.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Exploratory drilling for locatable minerals adjacent to the SGP on the west.</td>
<td></td>
</tr>
<tr>
<td>Forest Maintenance and Fire Risk</td>
<td>• Big Creek Fuels Reduction Project, approximately 10 miles north of the SGP.</td>
<td>Local GHG emissions from portable generators equipment (e.g., compressor engines), and vehicle tailpipe emissions. Expected to have GHG emissions that are temporary and a very small portion of the Idaho inventory¹.</td>
</tr>
<tr>
<td>Reduction</td>
<td>• South Fork RAMP, approximately 25 miles southwest of the SGP.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• East Fork RAMP, approximately 5 miles northwest of the SGP.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Projects to reduce wildfire risk and fire severity/intensity on NFS lands and private property using commercial timber harvest, understory treatment, and prescribed burning.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Granite Meadows, north and west of McCall.</td>
<td></td>
</tr>
<tr>
<td>Construction Projects</td>
<td>• Creek restoration.</td>
<td>Short-term GHG emissions during construction with no long-term emission impacts that would overlap with impacts related to the SGP.</td>
</tr>
<tr>
<td></td>
<td>• Trail construction and maintenance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bridge and culvert replacement projects generally located more than 10 miles north of the SGP.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hydroelectric projects: small residential projects for power generation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Road maintenance.</td>
<td></td>
</tr>
<tr>
<td>Project Type</td>
<td>Project Names/Description</td>
<td>Nature of Air Emissions and Contribution to Cumulative Effects</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Natural Emission Events      | • Wildland fires  
• Between 2005 and 2015, over 88,000 acres of the Big Creek watershed have been burned. Between 1990 and 2013 over 330,000 acres have burned within the headwaters of East Fork SFSR and Sugar Creek. In 2020, the Buck Fire burned 19,474 acres in the Johnson Creek Road area north of Warm Lake.                                                                 | Future fires may add additional GHG to the atmosphere.                                                                                                                                                                      |
| Mining Activities            | • Ongoing mining activities on patented land.  
• Mineral exploration and mining have occurred in several locations around the SGP area. Exploration activities are ongoing for potential future mining development.                                                                                                                                                                                                                              | Local emissions from drilling equipment (e.g., compressor engines), and tailpipe GHG emissions. Known mine operations are of small size (50 tons per day or less) or are inactive. Expected to have GHG emissions that are temporary and a very small portion of the Idaho inventory¹. |
| Reclamation Activities       | • ASAOC  
• Reclamation of certain legacy mining impacts including construction of stream diversion ditches, removal of 325,000 tons of development rock and tailings from Meadow Creek or East Fork SFSR that are currently impacting water quality.                                                                                                                                                                                                 | Local emissions from tailpipe GHG emissions. Expected to have GHG emissions that are temporary and a very small portion of the Idaho inventory¹. |
| Recreation and tourism      | Recreation and Tourist activities:  
• Sport hunting, fishing, trapping  
• Snowmobile trails/OSV use  
• Fugitive dust and tailpipe emissions from traffic on unpaved roads  
• Boating and river recreation  
• Camping, hiking, backpacking  
• Outfitter/Guide Operations  
• Tourist Services – Big Creek Lodge  
• OHV use  
• Tourist Services – e.g., Big Creek Lodge                                                                                                                                                                                                                                                                  | Collectively substantial GHG emissions from vehicles on unpaved roads and trails, boats, and stationary fuel combustion sources. These sources are already included in the Idaho inventory¹. |
| Other                        | Nez Perce Tribe Research Equipment  
Propane tank replacement project for a fish detection system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Short-term VOC and GHG emissions during installation. This source is already included in the Idaho inventory¹.                                                                                                               |

¹ The total Idaho GHG emissions estimates are 31.44 MMT (EPA 2021c).
5.4.2 **Action Alternatives**

While the magnitude and location of air emission sources associated with the SGP are different for the action alternatives, the differences are not sufficiently large enough to significantly affect GHG emission and climate change. The extent and magnitude of potential cumulative GHG emission and climate change effects due to foreseeable projects in the CEA when added to the GHG emissions and climate effects (Table 5.4-1) would be the same for both action alternatives.

Past and present actions that have influenced climate changes are expected to continue, such as existing infrastructure operations, transportation modes, plus energy and utility development and upgrades. RFFAs in the CEA would likely induce little additional change to climate change trends. While the individual impacts of the SGP are measurable, the cumulative effect is still considered to be limited, given the limited contribution of GHGs from the SGP over the region, state, or world.

5.5 **Soils and Reclamation Cover Materials**

The CEA for soils and RCM is the same as the larger analysis area defined in Section 3.5 that encompasses the various activity areas used for analysis of TSRC and DD. Thus, the CEA for this resource includes the sixth-level (12-digit hydrologic unit code) subwatersheds within which disturbance of SGP components would occur (Figure 3.5-1).

5.5.1 **No Action Alternative**

Under the No Action Alternative, there would be no open-pit mining or ore processing at the SGP, or construction disturbance for other supporting infrastructure and facilities. The effects of past mining activities and their long-term impacts to soils would remain except for the removal of legacy mine waste materials under Phase I of the ASAOC. Although removal of legacy material would reduce impacts to soil resources in the Phase I areas, effects from other legacy mining would continue. The ASAOC removal activities would target approximately 30 acres of historical tailings and waste rock that would also need to be reclaimed using locally obtained growth media from sources in the Operations Area Boundary near the removal locations.

Although none of the RFFAs identified in Table 5.1-3, except for the future geophysical work along the Burntlog Route, would physically overlap with the action alternative disturbance footprints, forest management, motorized use of road systems, fire suppression, prescribed fire and wildfire, dispersed camping, fishing, and hunting activities would continue in the CEA and vicinity, which would continue to utilize dedicated facilities (areas of TSRC) or contribute to incremental DD effects.

Under the No Action Alternative, Perpetua would continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using standard reclamation practices; however, as described in the Golden Meadows EA, the exploration and subsequent reclamation activities would have an insignificant direct effect to geology and soils and therefore an insignificant cumulative contribution to effects upon soils and RCM.
5.5.2 Action Alternatives

Past and ongoing activities in the CEA include forest management, mining and mine reclamation, mineral exploration (e.g., Golden Meadows Exploration Project), motorized use of road systems, fire suppression, prescribed fire and wildfire, dispersed camping, boating, fishing, and hunting. RFFAs include the East Fork RAMP and South Fork Plunge Watershed Restoration projects.

The potential for cumulative effects to soils and RCM, as it relates to the analysis of the issues and indicators for the SGP, would be additional soil disturbance within the activity areas for TSRC or incremental detrimental soil disturbance within the vicinity of SGP components. Ongoing mineral exploration activities associated with Perpetua’s Golden Meadows Exploration Project in the vicinity of the SGP would contribute a very small (less than 5 acres) incremental increase in disturbance within the PNF. Exploration activities associated with the Horse Heaven Project to the west could contribute an increase in disturbance within the BNF. Both projects would comply with reclamation and monitoring commitments, which would include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using standard reclamation practices. The East Fork RAMP and South Fork Plunge Watershed Restoration projects would have minor benefits to the TSRC by improving soil quality and related soil functions.

Phase 1 of the ASAOC work would be accomplished in 2022-2024; the other phases of the ASAOC scope of work would potentially be completed at later dates. Wildland fires that occur in the CEA could temporarily (i.e., 0 to 3 years) remove ground cover that holds soil in place, leading to increased erosion and sedimentation from burned areas, or lead to increased detrimental soil disturbance, especially if logging (or motorized use) were to occur in the area shortly after.

Increased regulatory control on soil erosion, verified by reclamation monitoring, would minimize impacts to soil productivity and erosion within the CEA.

5.6 Noise

The CEA for noise is a 5-mile radius of SGP components including proposed mine site and access roads, utilities, and offsite facilities (Figure 3.6-1), as noise from mining is attenuated by vegetation and topography to levels that are not discernable to humans at long distances. Noise related to access traffic and haul roads is of importance to persons along nearby public roads and in nearby residences.

Cumulative noise impacts typically occur when sensitive receivers are exposed to multiple noise sources at approximately the same time. The SGP, access roads, construction of utilities (transmission lines), and off-site facilities would each contribute to the noise environment at varying levels, durations, and locations during each SGP phase.

Past actions include activities such as mineral exploration, infrastructure development, and non-mining related actions are unlikely to present current noise impacts.

Present actions include mining projects, timber harvest or vegetation treatment; recreation; utility lines work, maintenance and use of the existing transportation network, urban development in Valley County, and private land development uses.
RFFAs in the vicinity of the SGP area that could affect the noise environment are described in Table 5.6-1. Each of these activities could contribute to noise levels in the CEA. Construction projects would likely contribute noise levels similar to the SGP but over discrete and likely short timeframes. The spatial distance between cumulative SGP sites would make it less likely that noise would be detectable at a given point from more than one RFFA; the impacts from noise are not expected to be additive because the SGP would not occur in the same place or the same time as most RFFAs.

The SGP has the greatest potential to contribute to cumulative noise impacts in the vicinity of the FCRNRW. However, given the mountainous topography, cumulative impacts would likely only occur if other ongoing or future actions in the general area occur within the same mountain valley or on nearby ridgelines.

**Table 5.6-1  RFFAs Considered Regarding Cumulative Noise Emissions – Ongoing Projects and Foreseeable Noise Sources**

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Names/Description</th>
<th>Nature of Noise Contribution to Cumulative Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Projects</td>
<td>• Creek restoration</td>
<td>Short-term noise emissions during construction with no long-term noise impacts that would overlap with impacts related to the SGP.</td>
</tr>
<tr>
<td></td>
<td>• Trail construction and maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bridge and culvert replacement projects, generally located more than 10 miles north of SGP area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hydroelectric projects: small residential projects for power generation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Road maintenance</td>
<td></td>
</tr>
<tr>
<td>Mining Activities</td>
<td>• Ongoing mining activities on patented land</td>
<td>Local noise from drilling equipment (e.g., compressor engines), and vehicles. Known mine operations are of small size (50 tons per day or less) or are inactive.</td>
</tr>
<tr>
<td></td>
<td>Mineral exploration and mining have occurred in several locations around the SGP area. Exploration activities area ongoing for potential future mining development.</td>
<td></td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>Recreation and Tourist activities:</td>
<td>Collectively noise from vehicles on unpaved roads and trails, boats, and generators.</td>
</tr>
<tr>
<td></td>
<td>• Sport hunting, fishing, trapping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Snowmobile trails</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Traffic on unpaved roads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Boating and river recreation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Camping, hiking, backpacking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outfitter/Guide Operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tourist Services – Big Creek Lodge OHV use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tourist Services – e.g., Big Creek Lodge</td>
<td></td>
</tr>
</tbody>
</table>

**5.7 Hazardous Materials**

The CEA for hazardous materials is bound by the bordering transportation routes that would provide access to the SGP.
5.7.1 No Action Alternative

Under the No Action Alternative, there would be no large-scale mine operations by Perpetua and use or transportation of certain hazardous materials would continue due to past, present, and reasonably foreseeable activities and by currently permitted Perpetua exploration activities as described in Section 5.7.2.

5.7.2 Action Alternatives

Cumulative effects associated with the SGP consider the range of existing and foreseeable activities and their potential effects with respect to hazardous materials. Past and present actions that have, or are currently, involving hazardous materials include the following:

- Perpetua Resources Operations and Exploratory Drilling from 2016 to 2019. The SGP has included transportation of fuel (diesel, gasoline, and jet fuel) to the mine site. This activity occurs on existing County and Forest Service roads.

- Mine Closure and Reclamation of Hecla and Stibnite Mine, Inc. mining and processing facilities occurred between 1993 and 2000. These activities were conducted near the headwaters of East Fork SFSR and Sugar Creek.

- CERCLA Actions. Several CERCLA removal actions were conducted by the Forest Service, EPA, and Exxon-Mobil Corporation. These activities were conducted at the proposed SGP mine site.

Some of the RFFAs have the potential to use some of the same roads as the SGP for access (e.g., Warm Lake Road, Johnson Creek Road, Stibnite Road). Although there is insufficient information about the nature of the RFFAs to assess specific hazardous materials usage, these RFFAs would similarly be required to comply with state and federal regulations regarding transport and use of hazardous materials. The Stallion Gold - Horse Heaven exploration project may use the same roads as it is adjacent to the Operations Area Boundary on the west. The Big Creek Hazardous Fuels Reduction Project in the Edwardsburg area north of Yellow Pine could be accessed via McCall - Stibnite Road; however, this project would involve 10,600 acres of treatment over a short period of time, such that the contribution of the action alternatives combined with this, and other similar projects would result in negligible changes to the overall traffic volume.

5.8 Surface Water and Groundwater Quantity

The CEA for surface water and groundwater quantity is the same area that could be directly or indirectly affected by the SGP on stream flows and/or the quantity of groundwater in storage, groundwater levels, and groundwater transmission (Figure 3.8-1).

Past and present actions that may have impacted water quantity through short-term water use include historical mining and reclamation activities in the area, as well as the Golden Meadows Exploration Project, which requires water for borehole drilling and other purposes.
The active Valley County Quarry (located near the village of Yellow Pine and about 7 miles to the west of the SGP area) may require some groundwater consumption, but since the quarry is located in a different sub-watershed from the SGP that is outside the CEA, it would not contribute to cumulative groundwater quantity impacts.

There are no RFFAs that have or would affect surface water and groundwater quantity in the CEA. In making this determination, a number of other nearby projects that have the potential to affect surface water and groundwater quantity were considered. These include Big Creek area’s small-scale hydroelectric projects plus the Morgan Ridge Exploration Project and Stallion Gold Horse Heaven Project. Although these projects could affect the surface water and groundwater systems within their respective watersheds, activities identified to date are located within a different sub-watershed from the SGP and lack direct communication via waterways to combine and result in cumulative water quantity effects.

5.9 Surface Water and Groundwater Quality

For surface water, the CEA includes 22 watersheds that encompass the SGP, access roads, transmission lines, and off-site facilities (Figure 3.9-1). For groundwater, the CEA includes two sub-watersheds that encompass the SGP (Figure 3.9-2).

Cumulative effects associated with the SGP consider the range of existing and foreseeable activities and their potential effects with respect to surface water and groundwater quality. Past and present actions that have, or are currently, affecting surface water quality include development projects, transportation projects, mineral exploration and mining activities, and mine closure and reclamation projects. Past and present actions that have or are currently affecting the mine site groundwater quality mainly include historical mining activity and recent mineral exploration undertaken by Perpetua.

RFFAs that could cumulatively contribute to water quality impacts in the CEA include:

- South Fork RAMP,
- East Fork RAMP,
- Gold Stallion Horse Heaven Project, and
- the Stibnite ASAOC.

5.9.1 No Action Alternative

The existing baseline surface water quality associated with the mine site is expected to improve to an extent due to the removal of legacy mining materials in contact with surface waters in Meadow Creek and the East Fork SFSR under the ASAOC Phase I. Phase I of the ASAOC is a separate action and not tied to the permitting of the SGP. Although impacts would likely be reduced due to a reduction of mine waste available for contact with surface water, elevated arsenic and antimony concentrations would persist as a cumulative impact with inputs from other historical sources (e.g., SODA) and inputs from natural sources that would continue to cause contaminant loading to the environment and influence Meadow Creek and East Fork SFSR stream water quality.
Cumulative surface water quality impacts also could occur in the CEA due to continuing surface exploration for the Golden Meadows Exploration Project. The continuation of approved exploration activities at the SGP by Perpetua could cumulatively increase stream sediment levels resulting from surface disturbance and erosion. Exploration activities also could cause cumulative surface water quality impacts through accidental spills of diesel, gasoline, and jet fuel stored at the SGP in aboveground tanks.

5.9.2 2021 Modified Mine Plan

Compared to the No Action Alternative, the 2021 MMP would remove additional legacy mining materials and further reduce their impacts on water quality but would also contribute new sources of mine waste material to the East Fork SFSR drainage. However, the new mine waste materials would be equipped with current technologies and design features (e.g., liner and cover systems) to reduce their impacts.

Across the rest of the CEA, future actions that could impact surface water quality would mainly affect stream temperatures and stream sediment concentrations. Other RFFAs in the CEA would mainly contribute sediment loading to adjacent streams. Although most of these future actions would likely have sediment control measures in place, the cumulative effect across the watershed may still include higher sediment loads in the East Fork SFSR and its tributaries.

Valley County Quarry, an active aggregate mine approximately 0.25 mile east-southeast of the village of Yellow Pine, is separated from the East Fork SFSR and Johnson Creek by the village itself, as well as several forest roads and native vegetation buffers. The quarry also includes surface water management features that retain runoff within the quarry perimeter (Forest Service 2017g). Thus, the Valley County Quarry would not contribute to cumulative surface water quality effects in the CEA.

5.9.3 Johnson Creek Route Alternative

Compared to the No Action Alternative and the 2021 MMP, cumulative effects to stream sediment concentrations from RFFAs would be affected by mine access because the Johnson Creek Route Alternative would require all mine-related traffic during construction, operations, and reclamation to use the Johnson Creek Route. This would increase traffic on Johnson Creek Route during the mine operational and reclamation period, leading to potentially higher erosion rates from the road surface along the Johnson Creek Route. The cumulative effect from this change could combine with other planned activities in the Johnson Creek watershed to increase the sediment load in Johnson Creek. This consideration is especially important given that Johnson Creek Road primarily follows the course of Johnson Creek.

5.10 Vegetation: General Vegetation Communities, Botanical Resources, and Non-native Plants

The CEA for vegetation resources is the same extent as the analysis area for direct and indirect impacts to vegetation, which is the 300-foot buffer around SGP components (Figure 3.10-1). Past and present actions in the CEA that have affected or are currently affecting vegetation resources are summarized in Table 5.10-1.
### Table 5.10-1 Past and Present Actions in the Vegetation Analysis Area

<table>
<thead>
<tr>
<th>Past or Present Action</th>
<th>Potential Effects on Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past and present mineral exploration and mining in the vicinity of the SGP</td>
<td>Vegetation has been removed and soil conditions have been altered in areas with past and present mineral exploration and mining in the vicinity of the SGP. Increased dust and transportation of non-native plant propagules associated with these projects have likely indirectly impacted vegetation communities in the vicinity of these areas.</td>
</tr>
<tr>
<td>Wildland Fire</td>
<td>Wildland fires have occurred in the vegetation analysis area, which has resulted in seral changes to vegetation communities. Fires have been both characteristic and uncharacteristic.</td>
</tr>
<tr>
<td>South Fork RAMP</td>
<td>The numerous actions relating to watershed restoration, motorized and non-motorized access, and improvements of recreation facilities within the SFSR watershed within a 329,000-acre project area are likely to impact vegetation communities and special status plants in various ways. Impacts to vegetation communities and special status plants were documented as part of the project analysis.</td>
</tr>
<tr>
<td>Removal of Firewood</td>
<td>Removal of firewood by the public has likely occurred in the vegetation analysis area, resulting in loss of coarse woody debris and snags over time, primarily adjacent to roads.</td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>Recreational activities (i.e., camping, hiking, hunting, trapping, trail riding, etc.) are likely to continue to affect vegetation communities. Increased road networks (e.g., new portions of the Burntlog Route) open new NFS areas to additional human disturbance, which will likely result in increased non-native plant spread and establishment in the analysis area.</td>
</tr>
<tr>
<td>Mineral exploration and mining activities</td>
<td>Exploration activities for potential future mining development in the vegetation analysis area have likely impacted vegetation via removal and soil compaction at drill pad sites and temporary roads and will likely continue to do so as these activities continue.</td>
</tr>
<tr>
<td>Transportation projects</td>
<td>Road maintenance projects (McCall-Stibnite Road [CR 50-412], Profile Gap Road [CR 50340] and the road to the Big Creek Trailhead, and Yellow Pine Road) are ongoing in the analysis areas. Roadways impact vegetation communities through habitat fragmentation, noxious weed introduction, and possibly dust propagation during construction. Maintenance projects for existing roadways will likely impact vegetation indirectly and only during the time of construction.</td>
</tr>
<tr>
<td>Infrastructure Development projects</td>
<td>Transmission line upgrades in the West Central Mountain Electric Plan 2014, which follows the general location Stibnite Mine transmission line route, have required removal of tall trees in the right-of-way for safe operation of the transmission line. Removal of tall trees has altered understory vegetation community composition and likely removed potential habitat for special status plants.</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020i, 2020j, 2020k, 2021c, and 2021d.

RFFAs in the CEA that are anticipated to impact vegetation resources are shown in Table 5.10-2. These RFFAs would result in loss of habitat, but all projects (private or federal actions) would have to meet the requirements of Section 7 of the ESA, which include consultation with federal agencies on listed plant species, completion of appropriate analysis documents, and compliance with agency-mandated reasonable and prudent measures to protect listed species.
Table 5.10-2  RFFAs in the Vegetation Analysis Area

<table>
<thead>
<tr>
<th>Project</th>
<th>Potential Effects on Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stibnite Mine Site ASAOC</td>
<td>This project’s purpose and need is to eliminate or reduce potential ecological and human exposure to metals by mitigating sources of contamination from contact with sediment and surface water. This will be accomplished through the removal of mill tailings and mine waste located within the channels and floodplain of the East Fork SFSR and select tributaries, and the diversion of surface water around mine wastes that are sources of metals. This project is located primarily along the East Fork SFSR and Meadow Creek at the mine site and would result in disturbance to vegetation.</td>
</tr>
<tr>
<td>East Fork RAMP</td>
<td>This travel management planning would likely impact vegetation communities and special status plants located within the spatial extent of the East Fork RAMP which could include Yellow Pine, Big Creek, and Thunder Mountain within the PNF. Impacts to vegetation communities and special status plants were documented as part of the project analysis.</td>
</tr>
<tr>
<td>Stallion Gold – Horse Heaven Project</td>
<td>Surface exploration of gold and antimony deposits. The project consists of 695 unpatented federal mining claims and mineral rights on 13,950 acres. This project would share its eastern boundary with the SGP.</td>
</tr>
</tbody>
</table>

Source: Forest Service 2020i, 2020j, 2020k, 2021c, and 2021d.

5.10.1 No Action Alternative

Forest management, motorized use of road systems, fire suppression, prescribed fire and wildfire, dispersed camping, fishing, and hunting activities would continue in the CEA and vicinity, which would alter vegetation resources through direct removal (trampling, cutting, harvest, etc.) and incidental damage. Under the No Action Alternative, Perpetua would continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which include reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using standard reclamation practices. However, as described in the Golden Meadows EA, the exploration and subsequent reclamation activities would have only a small direct effect on vegetation resources, as the disturbance footprint associated with the Golden Meadows EA is primarily isolated to temporary access roads to pads and the exploration drilling holes. Therefore, implementation of the No Action Alternative would present a minimal cumulative contribution to impacts to vegetation resources.

5.10.2 Action Alternatives

Acres of previous disturbance from past mining actions within 300 feet of the action alternatives are presented in Table 5.10-3. The total cumulative disturbance to vegetation in the CEA under both action alternatives is the sum of acres of previous disturbance within 300 feet of each alternative and the acres of previously undisturbed vegetation that would be impacted under each of the alternatives.

The 2021 MMP would result in the largest contribution to mining-related cumulative impacts to vegetation communities with the Johnson Creek Route Alternative impacting approximately 251 acres less. Cumulative impacts of the SGP on botanical resources and non-native plants would follow the same ranking as for vegetation communities, with the 2021 MMP having the highest potential and the Johnson Creek Route Alternative having a reduced potential for negative impacts on botanical resources and non-native plants in conjunction with past mining actions.
### Table 5.10-3  Cumulative Disturbance to Vegetation

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>2021 MMP</th>
<th>Johnson Creek Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Disturbance to Previously Undisturbed Areas</td>
<td>2,050.1²</td>
<td>1,841.0²</td>
</tr>
<tr>
<td>Previous Disturbance within 300 feet of an Alternative Footprint</td>
<td>1,593.6</td>
<td>1,552.1</td>
</tr>
<tr>
<td>Total Cumulative Disturbance to Vegetation within 300 feet of an Alternative Footprint³</td>
<td>3,643.7</td>
<td>3,393.1</td>
</tr>
</tbody>
</table>

Source: Perpetua 2021a; Acres of new disturbance to previously undisturbed areas were calculated by overlaying SGP components with PVG data (Forest Service 2005a, 2017g), VCMQ data (Forest Service 2016b, 2021d), and LANDFIRE data (USGS 2016a). Acres of previous disturbance within 300 feet of an alternative footprint were calculated by overlaying a 300-foot buffer of SGP components with previous mine site disturbance spatial data (Perpetua 2021a) and omitting areas of new disturbance.

1 Vegetation communities are defined for the purpose of these calculations as a combination of forest PVGs on NFS-administered lands, non-forest areas on NFS-administered lands identified through PVG mapping, and LANDFIRE vegetation classes outside NFS-administered lands.

2 Includes acreage associated with tall tree clearing as shown in Table 7-6 and Table 7-11 of the Vegetation Specialist Report (Forest Service 2022g).

3 Due to rounding, numbers presented in this table may not sum precisely to the totals provided.

PVG = Potential Vegetation Group.
VCMQ = Vegetation Classification, Mapping, and Quantitative Inventory.

Other past and present actions (Table 5.10-1) and RFFAs (Table 5.10-2) have and would likely impact vegetation communities, occurrences of special status plants including whitebark pine, habitats for special status plants, and distribution of non-native plants throughout the analysis area. Specific impact acreages of most of these actions on these resources are not known. It is likely that the ranking of potential contribution of the SGP alternatives when combined with other RFFAs on vegetation, most special status plants, and non-native plants would be the same as described in the preceding paragraph for mining-related impacts, with the 2021 MMP having the highest potential for cumulative impacts on these resources based on disturbance acreage. For whitebark pine, the potential for cumulative impacts would be lowest under the Johnson Creek Route Alternative and highest under the 2021 MMP based on disturbance acreage and estimated number of trees removed.

Cumulative impacts of the SGP on known special status plant occurrences from either action alternative would likely be the same as described in Section 4.10, even when considered with past, present, and RFFAs (i.e., no loss of viability or trend towards ESA listing for all species known to occur in the analysis area).

### 5.11  Wetlands and Riparian Resources

The CEA for wetlands and riparian resources is the same extent as the analysis area for direct and indirect impacts to these resources, which is the watersheds containing the SGP components (Figure 3.11-1). Potential cumulative effects to wetlands are limited to ASAOC activities.

#### 5.11.1  No Action Alternative

No new impacts to wetlands would occur under the No Action Alternative from the SGP. The SGP would not contribute to cumulative effects on wetlands or riparian areas in the CEA. Although no new impacts
would occur, existing elevated arsenic, antimony, and mercury concentrations would continue to contribute to contaminant loading to surface water, affecting adjacent and downstream wetlands.

Under the No Action Alternative, Perpetua would continue to comply with reclamation and monitoring commitments included in the applicable Golden Meadows Exploration Project Plan of Operations and EA, which includes reclamation of the drill pads and temporary roads by backfilling, re-contouring, and seeding using standard reclamation practices. However, as described in the Golden Meadows Environmental Assessment, the exploration and subsequent reclamation activities would have only a small direct effect on wetland and riparian resources, as the disturbance footprint is confined to exploration holes.

The CERCLA removal actions planned for Phase I of the ASAOC would disturb stream channels and adjacent riparian habitats to remove mining wastes from these areas. The stream channels would be restored better than their baseline conditions and the riparian habitats would also be restored.

Therefore, the No Action Alternative would not present a significant contribution to cumulative impacts on wetland and riparian resources.

5.11.2 2021 MMP

The 2021 MMP would result in temporary and permanent losses of approximately 119.8 acres of wetlands in the mine site focus area, 76.3 acres outside the mine site, and 1,054.4 wetland functional units (375.9 of which would be high-value functional units) (Forest Service 2022h). It is currently planned that required compensatory wetland mitigation would replace all permanently lost wetland acreages and functions, and therefore this alternative would not contribute to cumulative losses of wetland acreages or functions in the wetland and riparian resources cumulative effects analysis area.

5.11.3 Johnson Creek Route Alternative

The Johnson Creek Route Alternative would result in temporary and permanent losses of approximately 119.8 acres of wetlands at the mine site, 71.2 acres outside the mine site, and 1,028.3 wetland functional units (370.6 of which would be high-value functional units) (Forest Service 2022h). It is assumed that required compensatory wetland mitigation would replace all permanently lost wetland acreages and functions, and therefore this alternative would not contribute to cumulative losses of wetland acreages or functions in the wetland and riparian resources CEA.

5.12 Fish Resources and Fish Habitat

The cumulative effects analysis area for fish and aquatic habitat that could be directly or indirectly affected by the SGP is the same analysis area used to evaluate direct effects on fish and aquatic habitat, which consists of all of the watercourses and waterbodies in the HUC 6th field (10-digit code watersheds that overlap potential SGP disturbance areas (Figure 3.12-1).

Cumulative effects consider the range of existing and foreseeable activities and their potential effects with respect to fish and aquatic habitat when combined with the potential direct and indirect impacts of the SGP. Past and present actions that have, or are currently, affecting fish and aquatic habitat include past and current mining activities (including exploration), infrastructure projects, ongoing Forest Service
management projects, recreation, fishing, transportation projects, water diversions, hydropower projects, and wildland fires.

Reasonably foreseeable future actions that could cumulatively contribute to fisheries and aquatic habitat impacts in the analysis area include:

- South Fork RAMP,
- East Fork RAMP,
- Granite Meadows,
- Stallion Gold Horse Heaven Project,
- Burntlog Route Geophysical Investigation, and
- Stibnite ASAOC

5.12.1 No Action

The existing baseline conditions of fish and aquatic habitat in and adjacent to the mine site are expected to improve due to the removal of legacy mining materials that are in contact with surface waters in Meadow Creek and the East Fork SFSR under the ASAOC Phase I. The ASAOC is a separate action and not tied to the permitting of the SGP. Although impacts would likely be reduced due to a reduction of mine waste in contact with surface water, elevated arsenic and antimony concentrations would persist as a cumulative impact with inputs from other historical sources (e.g., SODA) and inputs from natural sources that would continue to cause contaminant loading to the environment and influence Meadow Creek and East Fork SFSR water quality. Cumulative impacts to fisheries also could occur at the SGP area due to continuing surface exploration for the Golden Meadows Exploration Project. These previously approved activities include construction of several temporary roads (approximately 0.32 mile of temporary roads) to access drill sites (total of 28 drill sites), drill pad construction (total of 182 drill pads) and drilling on both Forest Service and private lands at and in the vicinity of the SGP. The continuation of approved exploration activities at the SGP by Perpetua could cumulatively increase stream sediment levels resulting from surface disturbance and erosion. Exploration activities also could cause cumulative surface water quality impacts through accidental spills of diesel, gasoline, and jet fuel stored at the SGP in aboveground tanks. Similarly, exploration activities associated with the Stallion Gold Horse Heaven Project could contribute as well.

5.12.2 2021 MMP

Some of the RFFAs (Table 5.1-2) would occur in the same watershed and are expected to have similar types of impacts to fish and aquatic habitat as described for the 2021 MMP, such as increases in sediment and stream temperatures, stream flow reductions, and stream channel changes. However, because these projects appear to be at a smaller scale than the SGP, their impacts also would be less. These RFFAs also could have beneficial effects on fish and aquatic habitat in the long-term and are summarized below.

The South Fork RAMP and the East Fork RAMP include numerous actions related to watershed reclamation within the SFSR watershed and are therefore expected to have a long-term beneficial effect on habitat conditions for fish.
The PNF’s WCS would affect fish because one of its objectives to actively reclaim or maintain conditions for sensitive fish and 303(d) listed waterbodies.

Cumulative effects from large-scale management of Forest vegetation could include short-term disturbance of fish habitats and increases in sediment; but would be beneficial in the long-term. Table 5-12-1 provides a general description of effects on fish and aquatic resources from the other types of projects that are expected to occur in the CEA.

When combined with the potential impacts and duration of the 2021 MMP, the duration and scale of cumulative impacts on fish and aquatic habitat would be larger because all these projects would occur during the same time period. The resulting cumulative effect on fish and aquatic habitat in the CEA would be temporal losses or degradation of habitat and behavioral disturbances, along with some long-term beneficial effects from habitat improvements.

Table 5.12-1  Cumulative Effects on Fish and Aquatic Habitat from RFFAs

<table>
<thead>
<tr>
<th>Cumulative Project Type</th>
<th>Effects on Fish and Aquatic Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral exploration and mining activities</td>
<td>Currently planned or future mine development would affect fish and habitat during development through direct disturbance of habitat, increase sediment, changes in stream flow and temperature.</td>
</tr>
<tr>
<td>Closure and reclamation projects</td>
<td>Projects within fish habitat that are currently, or in the future, undergoing reclamation would likely improve fish habitat because these projects involve the removal of some infrastructure and reclamation of native habitats.</td>
</tr>
<tr>
<td>Transportation projects</td>
<td>Road maintenance, bridge or culvert replacement, and improvement projects are likely in the analysis area. Installation or improvement of culverts or bridges may impact fish habitat due to construction-related effects such as erosion and sediment in streams. Maintenance of existing roadways and culverts/bridges would create short-term impacts, while new roadways and culverts/bridges could have impacts for a longer period.</td>
</tr>
<tr>
<td>Recreation and tourism effects</td>
<td>Recreational activities such as fishing would continue to affect fish in the future. Fishing activities could decrease localized fish populations. These are regulated by the IDFG and would not lead to cumulative impacts when combined with impacts from the SGP.</td>
</tr>
<tr>
<td>Private Development Projects</td>
<td>Private residential developments are likely to have minor temporary impacts on fish and fish habitat, such as culvert installations or replacements, and increases in sediment related to construction and vehicle use in the future.</td>
</tr>
</tbody>
</table>

5.12.3  Johnson Creek Route Alternative

The effects discussed for the 2021 MMP for the SGP and RFFAs would also occur under the Johnson Creek Route Alternative. The use of the Johnson Creek Route rather than the construction of the Burntlog Route would increase the risk of spills and sedimentation in Johnson Creek and East Fork SFSR. Therefore, the cumulative effects from the Johnson Creek Route Alternative would be greater in degree with regards to spills and sediment compared to the 2021 MMP but would be comparable with regard to other effects.
5.13 Wildlife and Wildlife Habitat including Threatened, Endangered, Proposed, and Sensitive Species

The CEA for wildlife and wildlife habitat is the same as the area that could be directly or indirectly affected by the SGP consists of the analysis area shown on Figure 3.13-1.

Cumulative effects associated with the SGP consider the range of existing and foreseeable activities and their potential effects with respect to wildlife and wildlife habitat. Past and present actions that have, or are currently, affecting wildlife and wildlife habitat, as well as RFFAs that could cumulatively contribute to wildlife and wildlife habitat impacts in the analysis area include mineral exploration and mining activities, closure and reclamation projects, transportation projects, recreation and tourism effects, wildfire and noxious weed control projects, and development projects (Table 5.13-1).

Table 5.13-1 Cumulative Effects on Wildlife Species in the Analysis Area

<table>
<thead>
<tr>
<th>Cumulative Project Type</th>
<th>Potential Effects on Wildlife</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Exploration and Mining Activities</td>
<td>Several historic mines in the analysis areas have changed the habitat over time through removal of vegetation and displacement of wildlife species. Currently planned or future mine development will modify additional habitat types during development; these habitats will likely also be reclaimed in part on closure of the mine projects. During exploratory drilling, development, and operations, the increased noise and light impacts and road networks will be a source of disturbance and mortality for wildlife and will likely also displace several species.</td>
</tr>
<tr>
<td>Closure and Reclamation Projects</td>
<td>Projects that are currently undergoing reclamation, or will in the future, will likely improve habitat for wildlife. Additional habitat would generally become available to wildlife use within different time frames, depending on the type of reclamation. Early seral and grassland habitats would be available for wildlife within a short time, while mature forest types would not be available for decades.</td>
</tr>
<tr>
<td>Transportation Projects</td>
<td>Road maintenance, improvement projects, and bridge replacements are likely in the analysis areas. As roadways represent a threat to wildlife due to vehicle-wildlife collisions, habitat fragmentation, and noxious weed introduction, these types of projects are likely to also cause an impact on wildlife. Maintenance of existing roadways will likely only be short-term effects, while new roadways would have a larger effect.</td>
</tr>
<tr>
<td>Recreation and Tourism</td>
<td>Recreational activities (i.e., camping, hiking, hunting, trapping, trail riding, firewood harvest, etc.) are likely to continue to affect wildlife in the future. Increased road and trail networks open new areas to additional human disturbance, which can displace wildlife. Hunting activities also could decrease localized wildlife populations, although these are regulated closely by IDFG.</td>
</tr>
<tr>
<td>Wildfire and Noxious Weed Control Projects</td>
<td>Wildfires and noxious weeds have affected wildlife throughout the analysis areas. Additional wildfires are likely to affect wildlife in the future by reducing mature forest structure and transitioning to early seral communities. Small-scale harvesting of timber on private lands in the area also reduces the amount of forested habitat available. Control of invasive and noxious plant species also is likely to affect wildlife positively, because spraying or hand-pulling will reduce the invasive species present.</td>
</tr>
<tr>
<td>Development Projects</td>
<td>Private residential developments are likely to impact wildlife in the future. Native habitats would be disturbed for wildlife, and additional human presence would likely displace individuals.</td>
</tr>
</tbody>
</table>
These RFFAs would result in loss of habitat, but all projects (private or federal actions) would have to meet the requirements of Section 7 of the ESA, which include consultation with federal agencies (e.g., USFWS, NOAA, etc.) on listed species, completion of appropriate analysis documents, and compliance with agency-mandated reasonable and prudent measures to protect listed species. In addition, actions on PNF and BNF must meet the standards of the Forest Plans, which specifically addresses threatened, endangered, proposed, or candidate species, as well as sensitive species and species of special interest, such as elk, and related habitat.

5.13.1 No Action

Under the No Action Alternative, the CEA would still be impacted by the types of projects discussed in Table 5.13-1. Also included would be continued exploration work at Stibnite by Perpetua and the ASAOC Phase I mine waste removal project that would occur in 2022 - 2024.

5.13.2 2021 MMP

The 2021 MMP would impact 3,266 acres from the combined mine site, access roads, utilities, and off-site facilities, which would be a large increase of disturbed habitat compared to other past, present, and RFFAs in the CEA. Various components of this larger area would be considered habitat for different species, depending on the potential vegetation groups, tree size classes, and canopy cover classes present. However, these impacts would be offset and reduced through restoration of vegetation communities native to the area during the closure and reclamation process. The result is that long-term, net impacts (e.g., functional habitat losses and disturbed habitat in the analysis areas) would be reduced, although it would be decades before habitats would be restored to similar functionalities. The effects of road upgrades and traffic-related incidents with wildlife are likely under the 2021 MMP, which would contribute to the other past, present, and RFFAs.

Following closure and reclamation, existing and ongoing mineral exploration for the SGP would cease in the wildlife CEA. Activities that would continue in the future, and may contribute to cumulative effects on wildlife and habitats would include mineral exploration activities outside the Operations Area Boundary; other closure and reclamation projects; continued road use, transportation infrastructure improvements and maintenance; recreational and tourism activities; wildfire and vegetation management actions (e.g., mechanical vegetation treatment, salvage harvest, and prescribed fire); and private development projects. Potential cumulative effects from these types of actions would include further ground disturbance and habitat alteration. These RFFAs would have the potential to disturb wildlife habitats because of vegetation removal and ground disturbance. RFFAs would be governed by applicable laws and regulations and would be required to conform to applicable forest plan standards on PNF and BNF.

Cumulative impacts from past and present projects have resulted in temporary and permanent losses of habitats and ecological functions in the region, and future projects also would likely impact terrestrial wildlife species. However, the region is still somewhat remote and relatively wild, and the types of projects listed above are unlikely to significantly change this wilderness character in the near term, with the exception of additional wildfires reducing mature forest structure.
The 2021 MMP includes a variety of reclamation projects over the course of mine construction, operation, and closure and reclamation. However, the 2021 MMP would likely result in impacts that would be considered to permanently contribute to an adverse cumulative impact on these resources when combined with past, present, or RFFAs.

### 5.13.3 Johnson Creek Route Alternative

The Johnson Creek Route Alternative would impact 3,096 acres from the combined mine site, access roads, utilities, and off-site facilities footprints, and would be a large increase in the amount of disturbed habitat compared to other past, present, and RFFAs in the area. Because the size of the disturbance footprint is smaller than that of the 2021 MMP due to the absence of the Burntlog Route, the cumulative impacts of the Johnson Creek Route Alternative would be less than the 2021 MMP.

### 5.14 Timber Resources

The CEA for timber resources is the entire area of the PNF and BNF, as well as any commercial timberlands in Valley County. The analysis focuses on current and future projects on the PNF and BNF as those forests have established harvest volume limits and spatially designated lands suitable for timber production. Timber harvest projects occurring on commercial timberlands in the analysis area are unknown at this time and are therefore unavailable to consider in the analysis of cumulative effects to timber resources.

Cumulative effects associated with the SGP consider the range of existing and foreseeable activities and their potential effects with respect to timber resources. This includes past and present actions that have, or are currently, affecting timber resources and areas from which timber is harvested, as well as RFFAs that could cumulatively contribute to timber resource impacts in the analysis area. This list of projects includes timber harvest, as well as mineral exploration and mining activities, transportation projects, hazardous fuels and noxious weed control projects, and wildfires that could occur within the same timeframe as the impacts of SGP. Projects with a vegetation management component that includes incidental removal of conifer tree species would not be considered to cumulatively contribute to timber resource impacts in the CEA unless the project included sale of the cut conifer trees. The potential for cumulative effects associated with each project type, and example projects in the CEA, are described below.

#### 5.14.1 Forest Management

None of the current and future forest management projects within the timber resources CEA include a commercial timber sale component and are therefore not considered to contribute to cumulative impacts on timber resources.

#### 5.14.2 Mineral Exploration and Mining Activities

None of the currently planned or future mine development projects in the CEA include sale of cut trees at this time and therefore were determined to not contribute to potential cumulative effects on timber resources.
5.14.3 Transportation Projects

Road maintenance, improvement (widening) projects, and bridge replacements are likely to occur in the future in the timber resources CEA. Roadway projects could impact timber resources through removal of productive timber along roadways. Maintenance of existing roadways would likely be short-term, while new roadways could have a larger effect by removing timberland from permanent production, depending upon the location of the project and its proximity to land suited for timber production. Projects with a road improvement or transportation element include the East Fork RAMP on the PNF, the Granite Meadows project on the PNF, and the South Fork RAMP on PNF as well as BNF. Only the Granite Meadows project includes an explicit discussion of commercial timber sales and therefore it is the only transportation project that could contribute to cumulative effects on timber resources.

5.14.4 Hazardous Fuels Reduction and Noxious Weed Control Projects

Wildfires have affected timber resources throughout the analysis area and will continue to do so in the future. Future wildfires may affect timber resources, in the event they occur on land suited for timber production, by applying hazardous fuels reduction treatments to the landscape. The damaging effect of wildfire may be mitigated and projects with this aim could contribute beneficially to the cumulative effect of timber removal in the analysis area. Similarly, control of invasive and noxious plant species is likely to benefit timber resources by improving stand productivity. Fuels management projects include Big Creek Fuels Reduction and the Granite Meadows Project. Both Big Creek Fuels Reduction and the Granite Meadows projects include explicit discussions of commercial timber sales associated with fuels reduction activities therefore they both could contribute to cumulative effects on timber resources.

Two known RFFAs (the Big Creek Fuels Reduction Project and Granite Meadows Project) could result in loss of timber resources. However, all projects (private or federal actions) would have to meet the requirements of either National Forest Management Act of 1975 or The State of Idaho and Valley County, which include appropriate planning and compliance to meet their standards for timber stand health and productivity (sustained yield). In addition, actions on NFS lands must meet the standards of the Forest Plan, which specifically addresses annual harvest limits for timber resources on suited and unsuited timberlands.

5.14.5 No Action Alternative

Implementation of the No Action Alternative would present no cumulative impact contribution to timber resources.

5.14.6 Action Alternatives

Available information for RFFAs indicates timber harvest could occur on an additional 67,250 acres of the PNF with implementation of the Big Creek Hazardous Fuel Reduction Project and the Granite Meadows Project. It is unknown if any portions of these areas would occur on land suited for timber production, but if the entire acreage was on land suited for timber production, the combined harvest area would only represent 20 percent of the suited lands on the PNF. It also is not known what volume of timber resources these project areas support, but the projects are PNF-sponsored actions and therefore would be coordinated with the local silviculturist on the PNF and designed to not exceed ASQ and TSPQ. In addition, these projects would not remove suited lands from production, rather they would, by their
intent, maintain forest health and productivity. Implementation of activities proposed under the 2021 MMP, when combined with other potential activities associated with projects in the cumulative impact analysis area would not exceed harvest volume limits or contribute significantly to removal of timber from land suited for timber production in the CEA. Therefore, these activities would not result in impacts that would be considered to contribute to cumulative effect on timber resources.

5.15 Land Use and Land Management

The CEA for land use and land management would be the same as the analysis area for direct and indirect effects (Figure 3.15-1).

Cumulative effects associated with the SGP consider the range of existing and RFFAs and their potential effects with respect to land use and management. Past and present actions that have, or are currently, affecting land use and land management include ongoing and planned mining activities, exploratory drilling (e.g., Golden Meadows Exploration Project), reclamation and closure of mining and processing facilities, road and airstrip maintenance, infrastructure management and development, noxious weed control, recreation and tourism, water diversion projects, firewood and timber harvest on public and private lands, wildlife conservation and rehabilitation plans, creek restoration, trail construction and maintenance, and hydroelectric projects. RFFAs that could cumulatively contribute to land use and land management impacts in the analysis area include (briefly described in Table 5.1-2):

- South Fork RAMP,
- East Fork RAMP,
- Wildlife Conservation Strategy,
- Granite Meadows,
- Big Creek Hazardous Fuel Reduction,
- Morgan Ridge Exploratory Drilling, and
- Stallion Gold Horse Heaven Project.

5.15.1 No Action Alternative

Cumulative impacts to land use and land management under the No Action Alternative would result from the current ongoing activities combined with past and present actions, as well as the RFFAs in the CEA. These include ongoing and planned mining activities, exploratory drilling, reclamation and closure of mining and processing facilities, road and airstrip maintenance, infrastructure management and development, noxious weed control, recreation and tourism, water diversion projects, firewood and timber harvest on public and private lands, wildlife conservation and rehabilitation plans, creek restoration, trail construction and maintenance, and hydroelectric projects.

5.15.2 Action Alternatives

Cumulative effects associated with the action alternatives would occur in combination with past, present, and future actions if these actions result in changes in land use and land management, or if additional ROW or easements were authorized by federal, state, or local entities.
Land use would be impacted by the action alternatives from construction and operations of the mine site and construction of associated facilities (access roads, utilities, and off-site facilities). The conversion of these lands to mine and transportation uses, combined with past, present, and planned mining activities, would result in a larger portion of the analysis area being used for industrial and transportation land uses. Other activities that could change land management include ongoing and planned mining activities, exploratory drilling, reclamation and closure of mining and processing facilities, road and airstrip maintenance, infrastructure management and development, noxious weed control, recreation and tourism, water diversion projects, firewood and timber harvest on public and private lands, wildlife conservation and rehabilitation plans, creek restoration, trail construction and maintenance, and hydroelectric projects. Land use in the CEA would change from existing conditions as a result of the action alternatives and land management activities associated with the RFFAs.

5.16 Access and Transportation

The CEA for access and transportation includes the overall road system encompassing the SGP components (Figure 3.16-1). Transportation should not be substantially affected beyond this area; travel and transportation outside of the CEA would not likely be impacted by the SGP.

5.16.1 No Action Alternative

Under the No Action Alternative, there would be no SGP. The effects of past mining activities and the currently planned ASAOC and geophysical investigation activities would remain. The RFFAs identified in Table 5.1-3 including forest management, motorized use of road systems, fire suppression, prescribed fire and wildfire, dispersed camping, fishing, and hunting activities would continue in the CEA and vicinity, which could impact access and transportation in the CEA. Under the No Action Alternative, the Golden Meadows Exploration Project and Stallion Gold Horse Heaven Project would have a negligible direct effect to access and transportation and, therefore, a negligible cumulative contribution.

5.16.2 Action Alternatives

Supplies and deliveries for the SGP during construction, operations, and closure and reclamation would go to the SGLF using SH 55 to Warm Lake Road. Approximately two-thirds of all mine-related traffic would originate south of Warm Lake Road and would use SH 55 through the communities of Cascade, Banks, and Horseshoe Bend. Approximately one-third of all mine-related traffic would originate north of Warm Lake Road and would use SH 55 through the communities of Donnelly, Lake Fork, and McCall. Through McCall, mine-related traffic would use Deinhard Lane and Boydstun Street.

As previously discussed, the traffic for the action alternatives would travel on SH 55 to Warm Lake Road then either along Johnson Creek Road to Stibnite Road or along the existing Burnt Log Road and newly constructed Burntlog Route to access the SGP. The SGP would generate considerable impacts to access and transportation as the action alternatives would individually add over a 100 percent increase in traffic volume on Burnt Log Road, Johnson Creek Road, and Stibnite Road during construction and operations.

The local NFS roads within the CEA are in a rural area, and baseline traffic volumes are generally low. A higher percent increase in traffic volumes for the action alternatives would be likely the closer the roads are to the SGP. The South Fork RAMP, the East Fork RAMP, and the Big Creek Hazardous Fuel
Reduction projects are located closer to the SGP. The contribution to traffic volumes of the action alternatives which include traffic generated from the reconstruction of the transmission line combined with these projects would likely have a greater cumulative effect on the roadways closer to the SGP.

Contrary, the closer to the larger arterial (e.g., SH 55) and collector (e.g., Warm Lake Road) roads, the percent increase in traffic volume decreases to less than approximately four percent for the action alternatives. The Granite Meadows, SH 55 Banks Beach Parking Study, and SH 55 Round Valley Improvements projects are located along or accessed via SH 55 and would affect traffic along the major arterial and collector roads. The traffic contribution of the action alternatives combined with these projects would result in negligible changes to the overall traffic volume as the SGP-level volumes dissipate into the larger traffic volumes of other projects and general travel along these roads.

The ASAOC (EPA 2021) (Table 5.1-3) would be additive to anticipated SGP traffic. Light vehicle traffic is anticipated during 2022 with approximately five roundtrips every two weeks over three months, totaling 30 trips. Additionally, 28 trips would occur in support of seven fuel hauls. In total, light vehicle traffic would result in 58 trips total in 2022, and heavy truck traffic would result in approximately six roundtrips. The seven anticipated fuel haul trips would include three-truck convoys (using 4,500-gallon trucks), amounting to a total of 21 individual trips. In 2023, it is anticipated that 50 contractors would be traveling to and from the SGP, with five people per vehicle over six months. Light vehicle traffic (including buses and vans) would result in approximately 12 round trips every two weeks, for a total of 144 trips, plus 64 trips in support of 16 fuel hauls, which would amount to 208 trips total. Heavy truck traffic during 2023 would equal approximately 15 roundtrips. The 16 anticipated fuel haul trips would also include three-truck convoys (using 4,500-gallon trucks), amounting to a total of 48 individual trips.

As such, the SGP combined with other RFFAs would have a greater cumulative effect on roads closer to the Operations Area Boundary and less contribution on the larger arterials farther from the Operations Area Boundary.

**5.17 Heritage Resources**

The CEA for heritage resources is the same area as the VAV APE. This includes approved activities, such as continued mining and reclamation work on private land. Existing and future activities directly associated with a proposed action and other RFFAs provide the basis for defining and analyzing cumulative impacts.

Past actions (Table 5.1-2) have impacted heritage resources in the CEA. Mining activities have impacted archaeological and historic resources, as well as TCPs. Natural activities like wildfires also have impacted heritage resources and could continue to do so. Many of the past human activities were conducted prior to statutory and regulatory protection measures for historic properties resulting in the loss of unknown resources.

Present actions include mining projects and their related activities (i.e., exploration, reclamation) that are currently underway and are causing impacts. They also may include other non-mining related projects currently in progress, such as timber sales or vegetation treatment; recreation; other utility lines (e.g.,
powerlines) and roads; maintenance and use of the existing transportation network; urban development in
Valley County; private land development and uses; and sand and gravel extraction.

RFFAs are described in Table 5.1-3. Table 5.17-1 summarizes potential cumulative impacts to historic
properties from RFFAs.

**Table 5.17-1** RFFAs and Potential Cumulative Effects to Historic Properties

<table>
<thead>
<tr>
<th>Cumulative Project Type</th>
<th>Potential Effects to Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral exploration and mining activities</td>
<td>Historic mines in the analysis areas have changed the landscape over time through removal of vegetation and displacement of soils. Currently planned or future mine development would further alter the landscape from its pre-contact and historic state during exploratory drilling, development; and operations upon closure of the mine. During exploratory drilling, development, and operations, the increased ground disturbance may disturb historic properties.</td>
</tr>
<tr>
<td>Closure and Reclamation Projects/CERCLA Actions</td>
<td>Projects that are currently undergoing reclamation or will in the future would likely cause further damage to any historic properties in the area. These projects would likely be closed, which involves the removal of some of the infrastructure and reclamation of the land to restore native wildlife and plant habitats that are important to Native American tribes. However, mature forest types wouldn't be available for decades. Several CERCLA Removal Actions were conducted by the Forest Service, EPA, and Exxon-Mobil Corporation. These actions also can impact historic properties by removing potentially hazardous, but also historic, tailings and capping historic dumps.</td>
</tr>
<tr>
<td>Transportation projects</td>
<td>Road maintenance, improvement projects, and culvert replacements are likely in the analysis areas. These types of improvements cause ground disturbance that represents a potential impact to historic properties. Maintenance of existing roadways would likely only be short-term, while new roadways would have a more permanent effect. Also related to transportation projects are gravel quarry or gravel pit development to provide fill material for road construction. This activity would be a potential impact to any historic properties present in those areas.</td>
</tr>
<tr>
<td>Infrastructure Development</td>
<td>Local communities perform upgrades to infrastructure, such as electrical transmission lines. These development activities can cause ground disturbance that could impact historic properties, and they often involve physical upgrades to historic transmission lines.</td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>Recreational activities (i.e., camping, hiking, fishing, hunting, trapping, trail riding, firewood harvest, etc.) are likely to continue to affect historic properties in the future. Increased road and trail networks open new wilderness areas to additional human disturbance, which can increase access to historic properties in the APE potentially leading to vandalism or accidental destruction of artifacts of site features.</td>
</tr>
<tr>
<td>Wildfire and noxious weed control projects</td>
<td>Wildfires and noxious weeds have affected historic properties throughout the analysis area either by burning structures or by increasing visibility of pre-contact historic properties. Additional wildfires could affect historic properties in the future in the same way. Control of invasive and noxious plant species could have an effect on historic properties, as mechanical or hand-pulling would increase ground surface visibility and would cause some ground disturbance.</td>
</tr>
<tr>
<td>Development projects</td>
<td>Private residential developments could impact historic properties in the future. Pre-contact and historic landscapes would be lost, while additional human presence would potentially affect historic properties through increased access.</td>
</tr>
</tbody>
</table>
Cumulative Project
Type | Potential Effects to Historic Properties
---|---
Watershed Management | Watershed management can involve repairs and reclamation of roads and recreation site repairs to prevent erosion into watersheds, but many projects involve only monitoring of erosion of roadway sediments into watersheds, and this would not have an impact on historic properties. Ground disturbance from road repairs or reclamation could impact unidentified historic properties in those areas; however, the Forest Service Heritage Programs would generally complete archaeological surveys of any Forest Service roads or campsites being repaired or reclaimed so any historic properties encountered during the surveys could be avoided.

### 5.17.1 No Action Alternative
Cumulative effects associated with the No Action Alternative could occur with approved activities associated with the Golden Meadows Exploration Project or proposed such as the Stallion Gold Horse Heaven Project, such as exploratory drilling for mineral resources and construction of support facilities either by Perpetua or other groups on private land. The CERCLA work that is underway per the current ASAOC would continue over the next few years and would remove certain legacy mine waste deposits from flowing streams. Impacts to historic properties would be governed by the NHPA Section 106 process, and, therefore, minimal impacts would occur.

### 5.17.2 Action Alternatives
The 2021 MMP, taken together with other concurrent actions and RFFAs, would create an increase in ground disturbance and visual and noise intrusions along with increased public access in some areas and restricted access in other areas within the analysis area. These cumulative actions would increase the impacts to historic properties within the CEA. For all RFFAs on federally managed lands historic properties would be governed by the NHPA Section 106 process. RFFAs identified in the CEA could generate incremental changes to historic properties, exposing additional sites, or causing disturbance to the sites or their setting. Effects to historic properties would also occur due to physical disturbance or changes to the character or setting of historic properties. There would be adverse cumulative effects on historic properties. Cumulative impacts under the Johnson Creek Route Alternative would be similar to the 2021 MMP.

### 5.18 Public Health and Safety
The CEA for Public Health and Safety includes Valley County (no figure). Existing and RFFAs have the potential to result in cumulative impacts by increasing variables related to public health and safety.

#### 5.18.1 No Action Alternative
Under the No Action Alternative, there would not be the cumulative benefit of the SGP-related reclamation of legacy impacts in addition to those required under the ASAOC. There would be potential for wildfire from natural and man-made causes.

#### 5.18.2 Action Alternatives
Past and present activities and RFFAs that could cumulatively contribute to public health and safety impacts in the analysis area include all the projects listed in Table 5.1-2 pertaining to land use
management and development, road management, and hazardous materials management. The economic benefits associated with increased SGP employment opportunities and tax revenues, could lead to continued or improved access to health services (through employment insurance benefits and/or increased income), better nutrition, and better overall well-being for the local community. The potential negative effects from economic dislocation and disruption to local area economy after cessation of mine operations (“boom and bust” impacts) would be somewhat offset by the residual positive impacts on social economic conditions.

Because of the amount of activity associated with the 2021 MMP and Johnson Creek Route Alternative compared to the other activities and RFFAs, it is likely that cumulative impacts would not be noticeably different than the direct and indirect effects of the SGP.

### 5.19 Recreation

The CEA for recreation is the same as the analysis area for direct and indirect effects to recreation (Figure 3.19-1). Other past, present, and RFFAs occurring on federal and non-federal lands, with similar effects that overlap in time and space include forest management, mining and mine reclamation, road maintenance, campground upgrades, and winter motorized use of forest roads.

Past actions include activities that may have been initiated in the past but also could have lingering effects in degrading the environment or may influence trends in the physical, biological, or social environment.

Present actions include mining projects and their related activities (i.e., exploration, reclamation) that are currently underway and are causing impacts. They also may include other non-mining related projects currently in progress, such as timber sales or vegetation treatment; recreation; other utility lines (e.g., powerlines) and roads; maintenance and use of the existing transportation network; urban development in Valley County; private land development and uses; and sand and gravel extraction.

#### 5.19.1 No Action Alternative

Cumulative effects would be minimal as there would be minimal displaced recreation use or changes to recreation opportunities from the SGP. In the long term there would be some modifications to the recreation setting in the SGP area from continued surface exploration, continued low level of unauthorized motorized use, and increased winter motorized access and use. The RFFAs in combination with the No Action Alternative could result in cumulative effects to the designated ROS classes and the estimated ROS physical setting by increasing development, resulting in an overall increase in more developed ROS settings and a decrease in less developed settings within the CEA.

#### 5.19.2 2021 MMP

##### 5.19.2.1 Recreation Opportunities, Facilities, Use, and Recreation Special Use Permits

In general, construction of the 2021 MMP, could result in cumulative effects to the recreation setting due to additional noise and activity, cumulative effects to recreation experiences due to access delays, and further reduced recreation opportunities due to noise and wildlife displacement, but cumulative
construction-related effects would be temporary and conclude when the 2021 MMP construction activities concluded.

Other mining-related activities in the CEA would decrease the area for dispersed recreation due to physical development and wildlife displacement and also would decrease the overall area available for any recreation and permitted use displaced from the CEA due to impacts to recreation from the 2021 MMP. Development in the Big Creek area also may result in displacement of recreation and permitted use to other areas, possibly to campgrounds and wilderness trailheads south of Stibnite Road (CR 50-412). This displacement could increase recreation and permitted use within the analysis area, which may already see an increase in recreation use due to new motorized access, in addition to displacement of some recreation use to other areas. The South Fork RAMP, and the East Fork RAMP may in the short term also reduce the area available for displaced recreation use from the 2021 MMP and could result in displaced recreation use during restoration and development activities. Therefore, the reasonably foreseeable projects in combination with the 2021 MMP may result in cumulative effects to recreation use, recreation opportunities, and recreation special use permits.

### 5.19.2.2 ROS Classes and Physical Setting

Planned restoration projects of forest and roads would enhance the natural appearance of the greater cumulative area. However, mining and other development projects would likely decrease the natural appearance of the area and may lead to a decrease in non-motorized areas due to mine operations and new access roads, particularly north of Stibnite Road (CR 50-412) towards Big Creek. Overall, the RFFAs in combination with the 2021 MMP could result in cumulative effects to the designated ROS classes and the estimated ROS physical setting by increasing development, resulting in an overall increase in more developed ROS settings and a decrease in less developed settings within the CEA.

### 5.19.3 Johnson Creek Route Alternative

Cumulative effects would be similar to those described for the 2021 MMP; however, cumulative effects to recreation use, opportunities, and the recreation setting related to displaced use would be less due to use of the Johnson Creek Route instead of the creation of the Burntlog Route, which would both displace recreation use and increase recreation use in the CEA. However, any cumulative effects along Johnson Creek Road and Stibnite Road would be increased due to use as part of the Johnson Creek Route.

### 5.20 Scenic Resources

For scenic resources, the CEA is broader than the analysis area for direct and indirect effects; and in this case, includes areas on NFS lands in Valley and Adams counties (Figure 3.20-1), including several projects in the PNF and BNF.

#### 5.20.1 No Action Alternative

Under the No Action Alternative, neither action alternatives would be implemented, and no development of the SGP or supporting facilities would occur or be introduced. Some reclamation activities would still occur, such as those associated with the Meadow Gold exploration project and the Phase I of the ASAOC. These activities would contribute some visual changes to the landscape in the area of the historical mine
activities, but others would persist and continue to contribute to the cumulative visual changes to the landscape in the forest.

5.20.2 **Action Alternatives**

Legacy mining activities have impacted visual resources, including surface disturbances along roads, mining pits, and facilities; however, due to rugged terrain, visual impacts of these activities are highly localized. Activities associated with mineral exploration would locally increase the amount of vegetation removed to accommodate drill pad sites and improvement of access roads. Timber harvest activities also would contribute incrementally to landscape modification through the removal of vegetation over time. Forest management–related plans for noxious weed management, rehabilitation, and reclamation would result in a positive cumulative effect for the landscape by enhancing the natural, rugged setting that is characteristic of this area. There would be no new major utility corridors introduced through infrastructure development projects. Some mineral development projects have been put on hold in the CEA; but overall, mining activity has not significantly modified these backcountry landscapes. However, RFFAs, such as the Stallion Gold Horse Heaven project, could change that. The characteristic backcountry landscape setting would continue to be modified locally by these activities, but collectively, they would not trend toward a more highly developed or industrial-type setting. Disturbance associated with the SGP components would be reclaimed. Most disturbance areas would be reclaimed concurrently or at mine closure, and the visual effects of the disturbance would gradually decrease as vegetation matures reducing color contrasts. For areas where revegetation is not possible, color contrasts would be permanent because of the coloration and angular nature of the granitic rock against more surficial sedimentary type rocks. Permanent visual contrast would range from minor to major, and would contribute to the cumulative effects from past, present, and reasonably foreseeable actions.

5.21 **Social and Economic Conditions**

The CEA for social and economic conditions is the same area as the analysis area as described for direct and indirect socioeconomic effects (Figure 3.21-1). Other past, present, and reasonably foreseeable actions occurring on federal and non-federal lands, with similar effects that overlap in time and space include forest management, mining and mine reclamation, roadway changes, campground upgrades, and winter motorized use of forest roads.

Past and present mining and mining-related activities have occurred around the Stibnite Mining District for over 100 years. These activities have contributed to the local analysis area’s present socioeconomic conditions.

5.21.1 **No Action Alternative**

Under the No Action Alternative, the SGP would not be approved by the Forest Service. There would be no open-pit mining or ore processing in the SGP area, no new or upgraded access roads, no changes to utilities, and no construction of off-site facilities. Although none of the RFFAs identified in Table 5.1-2 would physically overlap with action alternative disturbance footprints, the existing or future activities such as forest management, motorized use of road systems, fire suppression, prescribed fire and wildfire, dispersed camping, fishing, and hunting activities would continue in the CEA and vicinity. These existing and future activities would remain and continue to contribute to the cumulative socioeconomic effects on
the local area’s residents, businesses, or economy triggered by or related to the RFFAs. Under No Action, continuation of the Golden Meadows Exploration Project and activity associated with the ASAOC would have negligible cumulative effects to socioeconomic conditions on the local area’s residents, businesses, and economy. Therefore, the No Action Alternative would result in negligible cumulative effects on the local area’s residents, businesses, and economy.

5.21.2 Action Alternatives

Social and economic conditions and effects within the CEA have occurred and would occur from past, present, and RFFAs. These effects have occurred primarily in Valley and Adams counties in terms of tax revenues, purchases of equipment and other services, and resulting employment income impacts.

The 2021 MMP, in addition to the reasonably foreseeable Stallion Gold Horse Heaven mining project, would provide the economic benefits associated with mine operations. The anticipated increases in the populations of Valley and Adams counties associated with in-migration as a result of these projects would be minor to moderate depending on the actual distribution of in-migrating resident locations. Further, there would be a related level of adverse cumulative effects to housing availability, housing affordability, community services, and infrastructure.

The SGP, ASAOC, and East Fork RAMP could have potential positive cumulative effects with regard to antimony and arsenic concentrations in water and reduced sedimentation; these effects could have an indirect effect on socioeconomics for activities benefiting from improved water quality such as recreation and fisheries restoration.

The cumulative effects under the Johnson Creek Route Alternative would be the same as under the 2021 MMP.

5.22 Environmental Justice

The CEA for environmental justice conditions is the same area as the analysis area for direct and indirect effects (Figure 3.22-1). Other past, present, and reasonably foreseeable actions occurring on federal and non-federal lands, with similar effects that overlap in time and space include forest management, mining and mine reclamation, roadway changes, campground upgrades, and winter motorized use of forest roads (Tables 5.1-2 and 5.1-3).

5.22.1 No Action Alternative

Cumulative effects associated with the No Action Alternative include past and present actions, as well as RFFAs. These include ongoing and planned mining activities, exploratory drilling, reclamation and closure of mining and processing facilities, recreation and tourism, timber harvest on public lands, and transportation projects. These projects could affect Tribal communities with environmental justice concerns by changing access to, availability, and/or quality of subsistence resources and/or traditional use area conditions, but the SGP would not contribute any additional impacts or restricted access.
5.22.2 Action Alternatives

Cumulative impacts resulting from constructing and operating the SGP and other simultaneous construction projects and RFFAs could alter access to Tribal traditional use areas and subsistence resources; use of identified sacred sites within the affected area (e.g., noise, vibration, and visual impacts); cause habitat loss, behavioral disturbance to resources from increased noise and human activity, concerns about contamination of resources, and avoidance by Tribal members of traditional use areas; and discourage and restrict subsistence use by Tribal members in proximity to construction activity locations.

The SGP and RFFAs may facilitate increased public and Tribal member access, particularly for recreational users. The South Fork RAMP and East Fork RAMP include numerous actions relating to motorized and non-motorized access and improvements of recreation facilities within the SFSR watershed. Other RFFAs, such as development in the Big Creek area, may result in displacement of recreation to other areas, possibly increasing recreation and permitted use within the analysis area, which may already see an increase in recreation use from the SGP. This increased access and use could result in potential indirect adverse cumulative impacts to Tribal members due to increased human activity if it results in actual or perceived decreases in their access to, availability, and/or quality of subsistence resources and/or traditional use area conditions.

In general, cumulative effects of the 2021 MMP or the Johnson Creek Route Alternative with other RFFAs and their potential to impact subsistence resource availability on Tribal communities with environmental justice concerns would potentially be adverse.

5.23 Special Designations

5.23.1 Wilderness

For untrammeled, natural, undeveloped, solitude, remoteness, and primitive recreation opportunities quality of wilderness character, the CEA includes NFS lands and projects in the Krassel and McCall Ranger Districts.

The following RFFAs have been identified that, in conjunction with the development of the SGP and the South Fork RAMP, could contribute to cumulative effects on the untrammeled, natural, and solitude, remoteness, and primitive recreation qualities of wilderness character.

- Stallion Gold Horse Heaven Project,
- East Fork RAMP, and
- Big Creek Hazardous Fuels Reduction Project

5.23.1.1 No Action Alternative

Under the No Action Alternative, the SGP would not be implemented. Topography and the distance between the FCRNRW and human activity at the SGP and locations of the RFFAs would not measurably change the untrammeled, natural, undeveloped, or solitude, remoteness, and primitive recreation opportunities quality of wilderness character compared to existing conditions.
Untrammeled

Under the 2021 MMP, the increase in human activity during the implementation of the RFFAs and construction and operation of the mine-related facilities could change the natural distribution of wildlife and plants. Increased human activity from project or recreation activities could change wildlife distribution into or from the FCRNRW or recommended wilderness areas. The extent where noise from these activities could change the natural distribution of wildlife would vary depending upon the season activities were implemented, duration, topography, and weather. The potential for non-native plant species establishment could increase. Surveys and treatments for non-native invasive species are ongoing in the cumulative impact analysis area. Each project is reviewed or surveyed for protected plant species and mitigation is developed where any of these species are found.

The RFFAs would be implemented during daylight hours on weekdays, limiting the extent and duration of potential changes to wildlife distribution. Surveys and implementing treatments as described in the Frank Church-River of No Return Noxious Weed Prevention Plan and the Integrated Weed Management program for the PNF and BNF would reduce the spread of non-native plant species. As such, the 2021 MMP, in combination with the RFFAs, could cumulatively impact the untrammeled quality of wilderness character.

Natural

Plants
The activities from the RFFAs and the 2021 MMP would result in additional land disturbance. The potential for non-native plant species establishment could increase either from project activities or from changes in recreation use. These effects have or would occur primarily along the western boundary of the FCRNRW near the Idaho-Valley County border and Logan Creek, or the recommended wilderness areas west of the SFSR. The potential for an increase in non-native plant species to establish with FCRNRW or recommended wilderness would be influenced by existing vegetation, site conditions, and non-native plant species characteristics. The extent where non-native plant species could become established is unknown. Surveys and implementing treatments as described in the Frank Church-River of No Return Noxious Weed Prevention Plan and the Integrated Weed Management program for the PNF and BNF would reduce the spread of non-native plant species. The potential for introduction and spread of non-native plant species increases as visitors may transport vegetative matter on clothing and equipment along attractive, improved trails. As such, the 2021 MMP and RFFAs would cumulatively impact natural quality of wilderness character where non-native plant species become established.

Fish and Wildlife
The SGP and the RFFAs would disturb sensitive wildlife species within the FCRNRW and recommended wilderness areas. These actions could increase wildlife mortality from vehicles. The extent where the natural wildlife distribution and movement could change or increase in mortality is unknown. A cumulative impact to the natural quality of wilderness character would occur where there is a decrease in wildlife habitat quality, an impact on wildlife distribution, or mortality from vehicles.
The South Fork and East Fork RAMPs in combination with the 2021 MMP could reduce sediment in the SFSR drainage and barriers to fish passage. Reducing sediment in the drainage would improve water quality and indirectly fish habitat quality.

Replacing culverts could reduce barriers to fish passage and improve aquatic species habitat connectivity within the SFSR drainage. Long-term improvements to fish habitat quality could increase fish populations in the SFSR drainage. The increase in fish populations in a specific stream is unknown. The natural quality of wilderness character could improve where sediment load in streams decline and barriers to fish passage are removed.

**Solitude, Remoteness, and Primitive Recreation Opportunities**

The extent that wilderness visitors see or hear human activities could cumulatively increase. The extent where noise from human activity within the FCRNRW and recommended wilderness areas is influenced by topography and weather. The duration of increased noise from the RFFAs and project activities would be temporary as implementing the RFFAs would be completed in 10 days to several months in a specific area during weekdays. A temporary cumulative impact on solitude, remoteness, and primitive recreation opportunities quality of wilderness character would occur.

### 5.23.1.3 Johnson Creek Route Alternative

Under the Johnson Creek Route Alternative, the cumulative impacts described for the 2021 MMP would essentially be identical, although the impacts would be somewhat reduced as the Burntlog Route would not be constructed and the location of impacts would be shifted to the Johnson Creek Route area.

### 5.23.2 Wild and Scenic Rivers

The CEA for WSRs includes all federally managed land and actions in the SFSR watershed, and includes any action that could affect other eligible, suitable, or designated WSR waterways in the watershed. The Seecsh River is in the SFSR watershed and is considered suitable for inclusion in the National WSR System. The upper and lower portions of the Secesh River are classified as Recreational, and the central portion, between NFST 080 and the Lick Creek Road portion of McCall-Stibnite Road (CR 50-412), is classified as Wild.

Cumulative effects associated with the SGP consider the range of existing activities and RFFAs and their potential effects with respect to WSR. Past and present actions that have, or are currently, affecting WSR and RFFAs that could cumulatively contribute to WSR impacts in the CEA are described in Sections 5.1.2 and 5.1.3 and have the following effects with respect to the WSR indicators:

- No cumulative impacts to the free-flowing characteristics of eligible and suitable WSRs.
- Improvements to the water quality of eligible, suitable, and designated WSRs would likely result from watershed management; CERCLA actions; and bridge/culvert improvement projects.
- Improvements to fish ORVs would likely result from the RFFAs.
- No impacts to the preliminary Wild, Scenic, or Recreational classification for eligible and suitable WSRs from these projects combined with impacts from the SGP.
5.23.3 Inventoried Roadless Areas

Effects on IRAs and the lands contiguous to unroaded areas could overlap in space and time with the direct and indirect effects and the following RFFAs:

- Stallion Gold Horse Heaven Project,
- South Fork RAMP,
- East Fork RAMP, and
- Big Creek Hazardous Fuels Reduction Project.

Cumulative effects from the SGP and RFFAs could affect naturalness and outstanding opportunities for solitude and primitive types of recreation.

5.23.3.1 No Action Alternative

Naturalness

The No Action Alternative could affect the wilderness attributes of naturalness and undeveloped character which inform impacts to roadless characteristics. Under the No Action Alternative, surface exploration authorized as part of the RFFAs could increase the potential for non-native invasive plant species to spread. The surface exploration for the Horse Heaven Project could disturb soils and remove vegetation in the Horse Heaven IRA while the Golden Meadow project and the RFFAs could disturb soils and remove vegetation adjacent to Sugar Mountain IRA. Surface disturbing activities could increase the spread of non-native invasive plant species into Horse Heaven IRA and the adjacent area of Sugar Mountain IRA. The extent where non-native invasive plant species could become established is unknown. Surveys and treatments implemented for the RFFAs would reduce the cumulative effects on the natural roadless character.

Outstanding Opportunities for Solitude and Primitive Recreation

The wilderness attribute of outstanding opportunities for solitude or primitive and unconfined recreation corresponds with the roadless area characteristic of primitive, semi-primitive non-motorized, semi-primitive motorized recreation opportunity spectrum classes of dispersed recreation. Under the No Action Alternative, noise from surface exploration authorized for the Horse Heaven and Golden Meadow projects combined with the East Fork RAMP and the ASAOC activities, could decrease outstanding opportunities for solitude within the area of Sugar Mountain, Meadow Creek, and Horse Heaven IRAs. The noise extent from the Horse Heaven and Golden Meadows projects mineral exploration in combination with the RFFAs is unknown. Topography and distance between surface exploration activities and the RFFAs influence the area where noise could decrease outstanding opportunities for solitude and primitive recreation.

5.23.3.2 2021 MMP

Naturalness

The 2021 MMP could affect the wilderness attributes of naturalness and undeveloped character which inform impacts to roadless characteristics. Surface disturbance and vehicles from SGP and RFFA
activities could spread non-native plant species. Depending on site conditions, and non-native plant species characteristics, non-native invasive plant species could spread into Sugar Mountain, Horse Heaven, and Meadow Creek IRAs. The extent where non-native invasive plant species could become established within these IRAs is unknown. Surveys and treatments implemented for the 2021 MMP and RFFAs would reduce the potential for non-native species to spread.

The 2021 MMP and the RFFAs could result in temporary to short term barriers to wildlife movement, disturbance, and increase vehicle-wildlife collisions. Wildlife mortality and distribution would be influenced by existing vegetation, site conditions, the wildlife species sensitivity to disturbance. The extent where wildlife distribution and movement could change or increase in vehicle-wildlife collisions is unknown. Changes in wildlife distribution from the activities associated with the 2021 MMP and the RFFAs could decrease natural roadless character in Meadow Creek, Horse Heaven, and Sugar Mountain IRAs.

Blowout Creek rock drain, hazardous fuel reduction, and potential changes to the miles of roads could reduce sediment in streams within the cumulative impact analysis area. Reducing sediment would improve water quality and long-term fish habitat quality. The extent and locations of streams where fish habitat quality could improve is unknown; however, increases in fish habitat quality within IRAs would improve natural roadless character.

**Outstanding Opportunities for Solitude and Primitive Recreation**

The wilderness attribute of outstanding opportunities for solitude or primitive and unconfined recreation corresponds with the roadless area characteristic of primitive, semi-primitive non-motorized, semi-primitive motorized recreation opportunity spectrum classes of dispersed recreation. Noise from the 2021 MMP and the RFFAs would decrease outstanding opportunities for solitude within Sugar Mountain, Horse Heaven, and Meadow Creek IRAs and lands contiguous to unroaded areas. The intensity of the effect would vary depending upon the forest visitor’s sensitivity. Human activity and noise during the 20 plus years of mine construction, operation, and closure and reclamation and the RFFAs decrease the area with outstanding opportunities for solitude. The extent where these effects could decrease roadless character within IRAs and lands contiguous to unroaded areas is unknown and influenced by topography, vegetation, and when activities for the RFFAs would be implemented.

### 5.23.3.3 Johnson Creek Route Alternative

**Naturalness**

The 2021 MMP could affect the wilderness attributes of naturalness and undeveloped character which inform impacts to roadless characteristics. Surface disturbance and vehicles from the Johnson Creek Route Alternative and implementation of the RFFAs could increase the potential for non-native plant species to spread into IRAs and lands contiguous to unroaded areas. Using Johnson Creek Route for mine access, combined with the RFFAs, could increase the vehicle traffic and increase the potential for non-native invasive plant species to spread. The extent where non-native invasive plant species could become established is unknown. Existing vegetation and site conditions would influence the spread of non-native invasive plant species. Surveys and treatments implemented for the Johnson Creek Route Alternative and the RFFAs would cumulatively reduce the effects on the natural roadless character.
Traffic on Johnson Creek Route during mine construction and operation, combined with the RFFAs, would increase habitat fragmentation and barriers to movement, noise, and potential vehicle-wildlife collisions. These actions could increase wildlife mortality and change the distribution of wildlife within Sugar Mountain and Horse Heaven IRAs. The potential for an increase in wildlife mortality and habitat fragmentation would be influenced by existing vegetation, site conditions, and wildlife sensitivity to disturbance. The extent where wildlife distribution and movement could change is unknown; however, areas within the IRAs and lands contiguous to unroaded areas that are avoided by wildlife would have less natural roadless character.

**Outstanding Opportunities for Solitude and Primitive Recreation**

The wilderness attribute of outstanding opportunities for solitude or primitive and unconfined recreation corresponds with the roadless area characteristic of primitive, semi-primitive non-motorized, semi-primitive motorized recreation opportunity spectrum classes of dispersed recreation. Forest visitors avoiding the SGP or areas of IRAs accessed from Johnson Creek Route and changes from access management plans could decrease outstanding opportunities for solitude within IRAs and lands contiguous to unroaded areas. The intensity of the effect would vary depending upon the forest visitor’s sensitivity. Human activity and noise related to the and the RFFAs could decrease outstanding opportunities for solitude. The extent where these effects could decrease roadless character within IRAs and lands contiguous to unroaded areas is unknown and would be influenced by topography, vegetation, and timing of when RFFAs are implemented.

**5.23.4 Research Natural Areas**

The RFFAs that could contribute to cumulative changes in research values, ecological site conditions, or change ecological processes within the CEA are:

- South Fork RAMP, and
- Big Creek Hazardous Fuels Reduction Project.

The SGP and these RFFAs include surface disturbing activities or changes in human activity that could indirectly affect research values and vegetation communities’ conditions within an RNA.

**5.23.4.1 No Action Alternative**

Under the No Action Alternative, the exploration and ASAOC activities at the SGP site and the RFFAs are over 6 miles from the RNAs. Belvidere Creek, the RNA nearest to the SGP, is approximately 6 miles north, reducing the potential for cumulative effects from the RFFAs and SGP reclamation and monitoring activities.

**5.23.4.2 2021 MMP**

The RFFAs would not impact the RNAs; therefore, no cumulative effects would occur in the RNAs.

**5.23.4.3 Johnson Creek Route Alternative**

Under the Johnson Creek Route Alternative, during mine construction and operation, recreation use could increase in other areas, such as the SFSR and Big Creek drainages.
Improvements and maintenance of Stibnite Road as part of the Johnson Creek Route could indirectly increase recreation use in the Big Creek drainage. Recreation use in the Big Creek drainage during the 20 years of mine construction and operation, combined with the implementation of the Big Creek Hazardous Fuels Reduction Project, could increase the potential for non-native invasive plant species to spread into Belvidere RNA, although this potential is low.

Increased recreation use from forest visitors avoiding the SGP, areas with increased traffic volumes and human activity, combined with surface disturbance associated with implementing the RFFAs, could increase the potential non-native invasive plant species to spread into Belvidere RNA. The potential for non-native plant species to spread into the RNA depends upon vegetation conditions and the non-native plant species characteristics.

Changes in vegetation community composition and structure within the Belvidere RNA would occur where non-native invasive plant species become established, soils compacted, or trails widen. Changes to vegetation community composition and structure would result in the long-term loss of research values, ecological site conditions, and ecological processes within the Belvidere RNA.

5.24 Tribal Rights and Interests

For tribal rights and interests, the CEA is larger than the analysis area for direct and indirect effects, encompassing lands administered by both the PNF and BNF, and other federal, state, and private lands within and adjacent to these National Forests (no figure). Cumulative effects to the Tribes extend well beyond NFS lands, and this larger area lends a broader landscape perspective to maintaining ecological sustainability in the National Forest, which support tribal rights and interests. The Nez Perce Tribe, Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes, and their traditional and cultural affiliations, trading networks, and other intertribal communication pathways existed long before current governmental and administrative boundaries and continue to exist irrespective of current delineations. For this reason, it is recognized that in addition to the SGP, other mining project developments expected to occur in the analysis area, Valley County, and possibly elsewhere in the region also may contribute to adversely affecting traditional tribal cultural practices and places that have significance to tribal cultural identities.

Past actions on federal, state, and private land have impacted tribal interests in the CEA. Mining and other activities on federal lands have impacted tribal rights and interests primarily by restricting access, but also by removing natural resources protected under treaties. Many of the past human activities (primarily historic mining in the analysis area) were conducted prior to statutory and regulatory protection measures for natural and cultural resources resulting in the loss of an unknown number of tribal resources and practices.

Descriptions of past, present, and RFFAs considered as part of the cumulative effects analysis are included in Table 5.24-1 and presented to summarize impacts from these types of activities for tribal rights and interests.
<table>
<thead>
<tr>
<th>Cumulative Project Type</th>
<th>Potential Effects to Tribal Rights and Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral exploration and mining activities</td>
<td>Historic mines in the analysis areas have changed the landscape over time through removal of vegetation and displacement of soils. Currently planned or future mine development would further alter the landscape from its natural state during exploratory drilling, development, and operations. During exploratory drilling, development, and operations, the increased ground disturbance may disturb tribal treaty rights, access to usual and accustomed fishing places and springs, tribal resources, historic properties, sacred sites or places, TCPs, and CLs.</td>
</tr>
<tr>
<td>Closure and Reclamation Projects/Comprehensive Environmental Response, Compensation, and Liability Act Actions</td>
<td>Projects that are currently undergoing reclamation or will in the future would likely cause further damage to any tribal treaty rights, tribal resources, historic properties, sacred sites or places, TCPs, and CLs in the area. These projects would likely be closed and reclaimed, which involves the removal of some of the infrastructure and reclamation of the land to restore native wildlife and plant habitats that are important to Tribes. However, mature forest types would not be available for decades. Several Removal Actions were conducted by the Forest Service, EPA, and Exxon-Mobil Corporation in the mine site and nearby. Perpetua is currently conducting such activities under a current ASAOC with EPA and Forest Service. These actions have the potential to restore landscapes that can eventually restore traditional tribal resources by removing potentially hazardous wastes, mining tailings, and capping historic waste rock dumps.</td>
</tr>
<tr>
<td>Transportation projects</td>
<td>Road maintenance, improvement projects, and culvert replacements are likely in the analysis area. These types of improvements cause ground disturbance that represents a potential impact to tribal resources, historic properties, sacred sites or places, TCPs, and CLs. Maintenance of existing roadways would likely involve short-term construction activity, while new roadways would have a more permanent effect and would impact previously undisturbed areas. Also related to transportation projects are gravel quarry or gravel pit development to provide fill material for road construction. This activity would be a potential impact to any tribal resources present in those areas.</td>
</tr>
<tr>
<td>Infrastructure Development</td>
<td>Local communities perform upgrades in infrastructure such as electrical transmission lines. These development activities can cause ground disturbance that could impact tribal resources, access to usual and accustomed fishing places and springs, historic properties, sacred sites or places, TCPs, and CLs. These activities can introduce visual and solitude impacts to tribal religious sites.</td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>Recreational activities (i.e., camping, hiking, hunting, trapping, trail riding, firewood harvest, fishing, etc.) are likely to continue to impact traditional tribal resources and potentially place pressure or compete with tribal treaty rights such as access to traditional fishing locations in the future. Increased road and trail networks open new areas to additional human disturbance, which can lead to potential vandalism or accidental destruction of tribal resources, historic properties, sacred sites or places, TCPs, and CLs.</td>
</tr>
<tr>
<td>Wildfire and noxious weed control projects</td>
<td>Wildfires have affected tribal resources throughout the analysis areas either by burning vegetation or by increasing visibility of Native American archaeological sites. Additional wildfires are likely to affect tribal resources in the future in the same way. Control of invasive and noxious plant species could have a minimal effect on tribal resources as mechanical or hand-pulling would increase ground surface visibility and would cause ground disturbance.</td>
</tr>
<tr>
<td>Watershed Management</td>
<td>This can involve repairs and reclamation of roads and recreation site repairs to prevent erosion into watersheds, but many projects involve only monitoring of erosion of roadway sediments into watersheds and this would not have an impact on tribal resources.</td>
</tr>
</tbody>
</table>
5.24.1 No Action Alternative
Cumulative effects associated with the No Action Alternative could occur with approved activities associated with the Golden Meadows Exploration Project or the proposed Stallion Gold Horse Heaven Project, such as exploratory drilling for mineral resources and construction of support facilities either by Perpetua or other groups on private land. Surface water quality associated with the mine site would improve to an extent due to the removal of legacy mining materials in contact with surface waters in Meadow Creek and the East Fork SFSR under the ASAOC. Cumulative impacts in the analysis area to tribal resources would be minimal in comparison with those under the action alternatives.

5.24.2 Action Alternatives
The 2021 MMP, taken together with other concurrent actions and RFFAs would create an increase in ground disturbance, visual and noise intrusions, increased public access in some areas and restricted access in other areas within the CEA. These cumulative actions would cause disturbances that may impact tribal traditional practices, access to usual and accustomed fishing places and springs, fisheries restoration activities, and resources of concern within the CEA.

Cumulative effects to tribal rights and interests under the Johnson Creek Route Alternative would be similar to the 2021 MMP.
6.0 CONSULTATION AND COORDINATION

6.1 Public Participation Summary

Initial issues and indicators to be considered in the EIS are identified through public and agency scoping. This process, along with the results of scoping, was documented in a public scoping report (AECOM 2018).

6.1.1 Public Scoping Period and Meetings

The NOI for the SGP EIS was published in the Federal Register on June 5, 2017. Additionally, a legal notice was published in two local newspapers on June 1, 2017; *The Idaho Statesman* in Boise, Idaho; and *The McCall Star News* in McCall, Idaho.

In-person open house public meetings were held in Cascade, McCall, and Yellow Pine, and two meetings were held in Boise, Idaho.

The open house meetings provided a Project overview, maps of the Project area, and a forum for exchange of information and ideas or concerns related to the Project. Comment forms were available at the meetings. The Forest Service, Perpetua, cooperating agencies, and AECOM representatives were present. Lists of individuals who signed attendance sheets at the public meetings are included in the Scoping and Issues Summary Report (AECOM 2018).

The PNF received a total of 536 submissions during public scoping. The Scoping and Issues Summary Report can be viewed here: https://www.fs.usda.gov/project/?project=50516.

6.1.2 EIS Mailing List

The initial public mailing list for scoping was compiled and scoping letters were sent out to 519 interested individuals, agencies, and groups. The list included persons and agencies the Forest Service determined may have interest in the Project from past experience, the mailing list for the Project was then revised to add those persons who provided comments in response to scoping, requested to be on the mailing list, signed a scoping meeting list, or responded to the e-mail request for mailing addresses. Notifications of availability of the DEIS were sent to over 1,900 individuals.

6.1.3 Distribution of DEIS

A NOA for the DEIS was published in the Federal Register August 20, 2020. The NOA initiated a 60-day comment period; in response to requests for extension, a 15-day extension was granted for public comments on the DEIS. In total, approximately 10,000 submissions were received during the 75-day comment period in response to the DEIS. During that time, a virtual, on-line Project information room provided Project data for review such as posters, documents, and figures; due to the COVID-19 pandemic, in-person public meetings were not held. In addition, DEIS reference documents were available via a linked document on the Project webpage, except for information held as confidential per Forest Service procedures.
6.1.4 Distribution of Supplemental DEIS

After the public comment period for the SGP DEIS, Midas Gold (now Perpetua) revised the Plan to address potential impacts and public concerns. The comments received on the SGP DEIS were reviewed as additional scoping input during development of this SDEIS.

Upon publication of the NOA for this SDEIS in the Federal Register, a 45-day SDEIS review period was initiated.

The SDEIS was distributed as follows:

- An NOA was published in the Federal Register specifying dates for the comment period and the date, time, and location of the public comment meetings.
- A news release was provided by the Forest Service at the beginning of the 45-day comment period on the SDEIS. Legal notices and news releases were submitted to the same news organizations as for the initial public scoping announcement and DEIS announcement.
- The SDEIS was distributed to interested parties identified in the updated EIS mailing list, as previously described, and made available via the PNF website.

Public meetings will be held to obtain comments on the SDEIS and to answer questions that the public has regarding the SGP or the EIS process.

6.1.5 Final EIS Distribution

The FEIS distribution will be completed after consideration is given to comments received on the SDEIS. A 45-day FEIS availability period will be initiated by publication of the NOA for the FEIS in the Federal Register. The FEIS will be released as follows:

- The NOA will be published in the Federal Register.
- Copies of the FEIS will be sent to addresses on the updated mailing list and made available via the PNF website.

Legal notices and news releases will be issued to the same media sources used for previous Project announcements.

6.1.6 Record of Decision

The Forest Service will release a draft ROD and begin an objection period concurrent with the 45-day availability for the FEIS. The Forest Service will not issue a draft ROD but will issue a final ROD after considering the FEIS and public comments received during the availability period. The Forest Service’s Final ROD will be distributed to those identified in the updated EIS mailing list. The Forest Service will post its Final ROD on the PNF Current and Recent Projects website which publishes the Schedule of Proposed Actions.
6.2 Consultation with Agencies and Tribal Governments

6.2.1 Cooperating Agencies
The Forest Service is the lead federal agency for this EIS. Two federal agencies, three state agencies, and Valley County are serving as cooperating agencies for this EIS and are listed below. These cooperating agencies are informing the EIS process and providing early input into certain issues addressed in the EIS, based on specific areas of jurisdiction by law and/or special expertise, and participating in development of an EIS that provides a full and fair disclosure of the probable impacts of the SGP, and that provides a sound basis for agency permit decisions. The following cooperating agencies participated in and informed the alternatives development and evaluation process to determine which alternatives would be carried forward for further analysis in the SDEIS.

- United States Army Corps of Engineers (USACE)
- United States Environmental Protection Agency (EPA)
- Idaho Governor’s Office of Energy and Mineral Resources (OEMR)
- Idaho Department of Lands (IDL)
- Idaho Department of Environmental Quality (IDEQ)
- Valley County

Coordination with federal and state agencies was ongoing throughout the preparation of the SDEIS with regularly scheduled calls and issue-specific meetings.

6.2.2 Endangered Species Act Section 7 Consultation
The Forest Service is collaborating with USFWS, NOAA/NMFS to comply with consultation procedures intended to satisfy their requirements under the ESA and NEPA.

Consultation, for purposes of both ESA and NEPA compliance, should be sensitive to the concerns and needs of the consulting and cooperating agencies. The Forest Service collaborative process included utilizing regularly scheduled monthly meetings, primarily for informal consultation discussions on fish species. Informal consultation is important for a project with potential impacts to federally listed species as it provides an opportunity for the lead federal agency (i.e., Forest Service) to communicate and collaborate with the applicant, USFWS, NOAA/NMFS, and other state and local agencies, to gather important information while developing the Project’s biological assessment (BA). Once the final BA is submitted to the USFWS and NOAA/NMFS, and the two federal agencies accept the BA as complete, informal consultation would end and the SGP would proceed with formal consultation due to potential effects to the federally listed species.

6.2.2.1 Endangered Species Act
The ESA (16 USC Ch. 35 Section 1531 et seq. 1988) is federal legislation that is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and animals. Aspects of the law pertaining to plants are administered by USFWS. The USFWS and NOAA/NMFS designate threatened, endangered, proposed, and candidate plant and wildlife species and their critical habitats under the ESA. Candidate species have no protection under the ESA, but they are often included in the
NEPA process for early planning consideration. Section 7 of the ESA generally requires federal agencies, in consultation with the USFWS and NOAA/NMFS, to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the continued survival of any ESA-listed threatened or endangered plant or wildlife species, or to adversely modify their designated critical habitat.

6.2.2.2 Informal Consultation History

Informal consultation on the Project began in 2017 and is ongoing. The pertinent letters, emails, meetings, and conference calls are summarized in a collaboration memo in the Administrative Record. Formal consultation will commence once the final BA is deemed complete and accepted by USFWS and NOAA/NMFS.

6.2.2.3 Species Considered and Evaluated

The following species have been included in informal consultation discussions based on suitable habitat and known occurrences in and around the Project.

- Canada Lynx (Federally Threatened)
- Northern Idaho Ground Squirrel (Federally Threatened)
- Wolverine (Proposed Threatened)
- Killer whale (Federally Endangered)
- Snake River Spring/Summer Chinook Salmon (Federally Threatened with Designated Critical Habitat)
- Snake River Basin Steelhead (Federally Threatened with Designated Critical Habitat)
- Columbia River Bull Trout (Federally Threatened with Designated Critical Habitat)
- Monarch butterfly (Federal Candidate)
- Whitebark Pine (Proposed Threatened)

6.2.3 Tribal Consultation and Government-to-Government Consultation

The Forest Service collaborated with Tribal partners to comply with consultation procedures intended to satisfy their requirements under NEPA and also the NHPA to ensure consideration for tribal resources and concerns in the context of these requirements.

Inherent in the tribal consultation process is also consideration for guidance set forth in EO 13175 Tribal Consultation and Coordination and EO 13007 Consultation with Tribes on Indian Sacred Sites. EO 13175 mandates that executive departments and agencies engage in regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications and are responsible for strengthening the government-to-government relationship between the United States and Indian Tribes. EO 13007 requires Federal agencies, to the extent practicable, to accommodate access to and use of sacred sites by Indian religious practitioners, and to avoid adversely affecting the physical integrity of such sacred sites. Both EO 13175 and 13007 should be considered in the context of the NEPA and Section 106 consultation process.

Consultation, for purposes of both NEPA and NHPA compliance, and including the mandates set forth in EO 13175 and EO 13007, should be conducted in a manner recognizing the unique government-to-
government relationship that exists between the federal government and tribes, should be respectful of tribal sovereignty, and should be sensitive to the concerns and needs of the Indian tribe or Native Hawaiian organization. The Forest Service collaborative process has included utilizing regularly scheduled periodic meetings to engage Indian tribes who may be interested or affected by the SGP, including the Nez Perce Tribe, Shoshone-Bannock Tribes, and the Shoshone-Paiute Tribes. The following sections describe the government-to-government consultation process and the framework within which the PNF implemented a collaborative process for tribal consultation in compliance with NEPA and the NHPA. Included in this collaborative approach is a process by which consulting parties, including Tribal partners, participate in the development of a PA designed to resolve adverse effects to historic properties under the NHPA Section 106 review process (Section 6.2.4).

6.2.3.1 Government-to-Government Consultation

The government-to-government relationship between federal agencies and federally-recognized tribes is a special relationship based on Tribal Sovereignty. The Forest Service is conducting government-to-government consultation regarding the SGP with the following federally-recognized tribes: the Nez Perce Tribe; Shoshone-Bannock Tribes; and the Shoshone-Paiute Tribes. This consultation process was initiated with the tribes through a notification letter from the Forest Service offering opportunities to participate in formal government-to-government consultation, to participate in the NEPA process as a cooperating agency, and/or to routinely receive information about the SGP.

Tribal governments have a special and unique legal and political relationship with the U.S. government as reflected in the U.S. Constitution, treaties, statutes, court decisions, executive orders, and memoranda. This relationship imparts a duty on all federal agencies to consult, coordinate, and communicate with American Indian tribes on a government-to-government basis.

The intergovernmental consultation process serves as the primary means for the federal agencies to carry out their trust responsibilities/obligations. Consultation is not a single event, but instead is an informed process leading to a decision. Consultation means different things to different tribes. It can be either a formal process of negotiation, cooperation, and policy-level decision-making between tribal governments and the federal government, or a more informal process. Tribal rights, ideas, and interests are discussed and considered or incorporated into the decision. Tribal consultation is an on-going relationship between agencies and tribes, characterized by consensus-seeking approaches to reach mutual understanding and resolve issues. It may concern issues and actions that could affect the government’s decision-making processes, or other tribal interests.

Consultation minimally serves five purposes:

- To identify and clarify issues;
- To provide for an exchange of existing information and identify where information is needed;
- To identify and serve as a process for conflict resolution;
- To provide an opportunity to discuss and explain the decision; and
- To fulfill the core of the federal trust obligation.
Because Native American tribes can be affected by the policies and actions of the Forest Service in managing the lands and resources under its jurisdiction, the Forest Service has a duty to consult with them on matters affecting their interests. Because of this government-to-government relationship, efforts were made to involve local tribal governments and to solicit their input regarding the SGP.

The Forest Service first notified Nez Perce Tribe cultural resource staff about the SGP on March 1, 2017. Formal consultation with the Nez Perce Tribe was requested and initiated on May 23, 2017. The Nez Perce Tribe formalized opposition to the SGP in a resolution passed by the Nez Perce Tribal Executive Committee (the governing body of the tribe) on October 9, 2018 and announced opposition in a press release the same day. Despite formal opposition to the SGP, the tribe continues to participate in a previously established Project-specific informal consultation process, including discussion on ways to avoid, reduce, or mitigate impacts.

The Forest Service introduced the SGP to Shoshone-Paiute Tribal leadership during the Wings and Roots Program meeting (government-to-government consultation) on April 13, 2017.

The SGP was formally presented to the Shoshone-Bannock Tribes Fort Hall Business Council and also informally to tribal staff on July 26, 2017.

Updates to each of these tribes are provided in an ongoing basis during Project-specific ad-hoc consultation meetings, and the Forest Service will continue to engage in government-to-government consultation throughout the NEPA process.

The structure of formal government-to-government consultation is between tribal governing bodies (Executive Committee, Tribal Councils, Tribal Chairperson, traditional Chiefs, or those identified formally by a tribe’s governing body as ‘representative’ of that tribe’s interests) and Forest Service Line Officers. Staff-to-staff meetings usually include Forest Service technical specialists and tribal liaison and technical specialists.

The Shoshone-Paiute Tribes do not conduct informal consultation; however, they have professionally moderated meetings between the Tribal Business Council Chair and the Forest Service Line Officers, with other members of the Council and/or tribal staff occasionally attending as well.

USACE has been represented in one or more Project-specific Forest Service consultation meetings with each of these tribes, in an informal capacity, to offer information on the CWA Section 404 permitting process.

The Nez Perce Tribe, Shoshone-Paiute Tribes, and Shoshone-Bannock Tribes were invited on April 30, 2020, to participate in development of a project-specific PA and associated historic properties treatment plan and historic properties management plan, which are being prepared to mitigate impacts and address Section 106 of the NHPA compliance.
6.2.4 NHPA Section 106 Process

6.2.4.1 NEPA and NHPA Policy Guidance and Process

Under the NEPA process, agencies evaluate the environmental and related social and economic effects of their federal action (40 CFR 1508.1(q)). Requirements in Sections 1501.2 and 1501.7 of the CEQ regulations call for the involvement of Tribes that may be affected by a federal proposal.

Review under the NHPA, often referred to as Section 106 review, is focused only on historic properties; defined in the NHPA (54 U.S.C. § 300308) as any “prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places, including artifacts, records, and material remains related to such a property or resource.”

Although NEPA and the NHPA are two separate laws which require federal agencies to take into consideration the effects that a proposed project may have on historic properties, integration of the review process allows for efficiencies, promotes accountability and transparency in the consultation process, and encourages a broader discussion of potential effects to the human environment including historic properties. Since Section 106 review must be completed prior to the completion of NEPA review, an integrated approach could include the combination of public involvement efforts, efforts to identify and assess potential effects to historic properties, and in the final stages of the process a path to resolve adverse effects. This approach not only meets the requirements and intent of Section 106 review, but it also informs the NEPA review process required to reach a ROD for a project. For projects where NHPA and NEPA compliance is required, the ACHP can be offered the opportunity to participate in the process and may offer guidance on the integration of reviews where they address potential effects to historic properties.

Under the NHPA process, agencies evaluate if there might be an effect to historic properties from a federal undertaking (36 CFR 800.16(y)). If an effect is identified, the agency proceeds with Section 106 review which involves identifying and assessing what historic properties could be affected by the project. The Section 106 process is by nature intended to be collaborative, and consulting parties should be included in and participate in the process. Consulting parties may include the State (or Tribal) Historic Preservation Officer, local government, interested federally recognized Indian tribes or Native Hawaiian organizations, and other interested parties. Historic preservation organizations and others with an interest in the preservation outcomes of the project or those with a legal or economic interest may also be invited to join Section 106 consultation.

The NHPA outlines when federal agencies must offer consultation with Tribes and the issues and other factors this consultation must address. Tribal consultation is required, if there is a potential affect to a tribe(s), in all steps of the Section 106 process when a federal agency undertaking may affect historic properties that are either (1) located on tribal lands, or (2) when any Indian tribe or Native Hawaiian organization attaches traditional use and/or religious or cultural significance to the historic property, regardless of the property’s location. This consultation should take place through the formal government-to-government consultation process as described in the previous section. To reiterate, the intergovernmental consultation process serves as the primary means for the federal agencies to carry out their Section 106 responsibilities/obligations under Section 106 of the NHPA and NEPA. Because Native American tribes can be affected by the policies and actions of the Forest Service in managing the lands
and resources under its jurisdiction, the Forest Service has a duty to consult with them on matters affecting their interests.

NHPA, Section 101(d)(6)(A) establishes that historic properties of “traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion” in the NRHP. Federal agencies are specifically instructed to consult with relevant Indian tribes or Native Hawaiian organizations when an undertaking may affect properties of traditional religious and cultural importance. These properties may be located on ancestral, aboriginal, or ceded lands of Indian tribes and Native Hawaiian organizations. The consultation requirement for properties of traditional religious and cultural importance applies regardless of the location of both the historic property and the Indian tribe or Native Hawaiian organization.

General principles for federal agencies in Section 106 tribal consultation include:

- Federal agencies shall ensure that tribal consultation in the Section 106 process provides the Indian tribe or Native Hawaiian organization with a reasonable opportunity to identify its concerns about historic properties, advise on the identification and evaluation of historic properties, articulate its views on the undertaking’s effects on such properties, and participate in the resolution of adverse effects.

- It is the responsibility of the federal agency to make a reasonable and good faith effort to identify Indian tribes and Native Hawaiian organizations that shall be consulted in the Section 106 process.

6.2.4.2 Development of the NHPA Programmatic Agreement

Through the Section 106 and NEPA review process, the Forest Service determined that the authorization of the SGP would result in adverse effects to historic properties and that the resolution of these adverse effects could be completed through the negotiation and eventual implementation of a project-specific PA.

Because of the SGP’s size, scope, and various alternatives under consideration, the Forest Service as the lead federal agency, initiated preparation of the PA as a management tool to address project effects on cultural resources and to minimize or resolve any potential adverse effects.

A PA outlines measures for compliance with Section 106 of the NHPA, including but not limited to: protocols for the identification and evaluation of historic properties; permitting requirements; treatment of historic properties; monitoring requirements; inadvertent discovery protocols; curation; and treatment of human remains. The SGP PA would identify known adverse effects to historic properties and provide a discussion of proposed mitigation measures that would be implemented. The SGP PA would also include a historic properties treatment plan and historic properties management plan to further refine the requirements for resolution of adverse effects and complete the Section 106 process. A PA is a legal document with signatories and concurring parties. The PA will be fully executed prior to completion of the ROD.

The Forest Service is collaborating with Consulting Parties in the development of the PA in order to comply with consultation procedures intended to satisfy their requirements under the NHPA and the
NEPA. On April 30, 2020, the Forest Service initiated the consultation process for the development of the PA by extending invitations to participate in the process pursuant to the regulations of Section 106 of the NHPA to interested parties. Letters were sent to the Nez Perce Tribe, Shoshone-Paiute Tribes, and Shoshone-Bannock Tribes with a request for response within 30 days. Additionally, invitations were extended to the USACE, IPCo., Perpetua, the SHPO, and the ACHP.

The Forest Service collaborative process includes utilizing regularly scheduled periodic meetings to engage the identified Consulting Parties to the PA who are listed in Table 6.2-1.

### Table 6.2-1  Programmatic Agreement Consulting Parties

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role in Project and PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States Department of Agriculture, United States Forest Service, Payette National Forest (Forest Service)</td>
<td>Lead Federal Agency, Signatory</td>
</tr>
<tr>
<td>Idaho State Historic Preservation Office (ID SHPO)</td>
<td>Section 106 Compliance, Signatory</td>
</tr>
<tr>
<td>Advisory Council on Historic Preservation (ACHP)</td>
<td>Signatory</td>
</tr>
<tr>
<td>Idaho Power Company (IPCo)</td>
<td>Invited Signatory</td>
</tr>
<tr>
<td>Perpetua Resources Idaho Inc. (PRII)</td>
<td>Project Proponent; Invited Signatory</td>
</tr>
<tr>
<td>Nez Perce Tribe</td>
<td>Consulting Party</td>
</tr>
<tr>
<td>Shoshone-Bannock Tribes</td>
<td>Consulting Party</td>
</tr>
<tr>
<td>Shoshone-Paiute Tribes</td>
<td>Consulting Party</td>
</tr>
<tr>
<td>United States Army Corps of Engineers (USACE)</td>
<td>Consulting Party</td>
</tr>
<tr>
<td>Mary Anne Davis</td>
<td>Consulting Party</td>
</tr>
</tbody>
</table>

#### 6.3  Ongoing Coordination Efforts

Coordination with cooperating and other permitting agencies will continue to occur following the release of the SDEIS. Agency expertise will remain important for informing the analysis and addressing comments from the public to develop the Final EIS. Consultation with the USFWS and NOAA/NMFS will continue for ESA and EFH assessments.

The Forest Service remains available for government-to-government consultation with federally recognized tribes. Government-to-government consultation is an ongoing effort by the Forest Service to share information, answer questions, listen to concerns, and resolve issues.

Consultation and coordination with consulting parties to resolve adverse effects to historic properties in accordance with Section 106 of the NHPA will continue. A PA will be developed through discussions with the consulting parties to ensure that the requirements of Section 106 are satisfied. The Forest Service intends to complete the PA in the same timeframe as the FEIS and ROD.

A NOA of this SDEIS was published in the Federal Register informing stakeholders and other members of the public that the SDEIS is available for comment for 60 days. It is the intent of the Forest Service to
host a virtual public open house during the SDEIS comment period due to the COVID-19 pandemic.
Please refer to the “dear reader” letter at the beginning of this document for more information.

The Project website will continue to be updated throughout the EIS process, and the Schedule of Proposed Actions will be updated quarterly throughout the process.

6.4 List of Preparers and Reviewers

The SGP EIS was prepared under the supervision of the Forest Service. The individuals who contributed to the preparation of this document are listed here by organization, along with their Project role, education, and years of experience as appropriate (Tables 6.4-1 through 6.4-4).

The following Forest Service personnel were involved in review of the SDEIS and/or related Project documentation (Table 6.4-1).

Table 6.4-1 Forest Service

<table>
<thead>
<tr>
<th>Forest Service Reviewer</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linda Jackson (PNF)</td>
<td>Forest Supervisor</td>
</tr>
<tr>
<td>Kevin Knesek (PNF)</td>
<td>Deputy Forest Supervisor</td>
</tr>
<tr>
<td>David Hogen (PNF)</td>
<td>Krassel District Ranger</td>
</tr>
<tr>
<td>Jake Strohmeyer (BNF)</td>
<td>Cascade District Ranger</td>
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<tr>
<td>Paul Klasner (PNF)</td>
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<td>Sarah Lau (PNF)</td>
<td>Recreation, Engineering, Archaeology, Lands and Minerals Staff Officer</td>
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<tr>
<td>Ronda Bishop (PNF)</td>
<td>Administration and Planning Staff Officer</td>
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<td>Brian Harris (PNF)</td>
<td>Forest Public Affairs Officer and Tribal Liaison</td>
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<tr>
<td>Sitka Pence (WO)</td>
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<td>Kellie Brown, ret. (PNF)</td>
<td>Administrative Assistant</td>
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<tr>
<td>Josh Sampson (PNF)</td>
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<td>Morgan Zedalis (PNF)</td>
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<td>Susie Osgood (BNF)</td>
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<td>Susan Miller (PNF)</td>
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<tr>
<td>Pleasant McNeel (R4)</td>
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<td>Brinda Ramanathan (R4)</td>
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<td>June Galloway (PNF)</td>
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<td>Todd Leeds (PNF)</td>
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<td>Kristin Williams (PNF)</td>
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<td>Megan Heider (PNF)</td>
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<td>Jason Wright (PNF)</td>
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<td>Clayton Nalder (PNF)</td>
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<td>John Dixon (PNF)</td>
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<td>William Perry (PNF)</td>
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<td>Forest Service Reviewer</td>
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<tr>
<td>Natalie Little (R4)</td>
<td>Regional Sustainable Operations &amp; Climate Change Coordinator</td>
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<td>Kathy Zamba (R4)</td>
<td>Environmental Engineer</td>
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<tr>
<td>Heidie Torrealday (R4)</td>
<td>Regional Geologist</td>
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<tr>
<td>Edward Gazzetti (WO)</td>
<td>Minerals and Geology Management - Hydrogeologist</td>
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<tr>
<td>Chris Miller (WO)</td>
<td>Economist</td>
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<td>Bret Anderson (WO)</td>
<td>Physical Scientist</td>
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<tr>
<td>Jacob Deal (WO)</td>
<td>GHG ORISE Fellow</td>
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<tr>
<td>Catherine Doyle-Capitman (WO)</td>
<td>National-Level Social Scientist</td>
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<tr>
<td>Jennifer Purvine (WO)</td>
<td>Planning Biologist/IDT Leader</td>
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<tr>
<td>Christine Bradbury (RO)</td>
<td>R1/R4 Tribal Liaison</td>
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<tr>
<td>Daniel Morris (RO)</td>
<td>Wilderness and Wild and Scenic River Program Manager</td>
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<tr>
<td>Amy Marshall (R4)</td>
<td>Idaho Roadless Coordinator</td>
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<tr>
<td>Ilia Fiene (R4)</td>
<td>Landscape Architect</td>
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BNF = Boise National Forest; ORISE = Oak Ridge Institute for Science and Education; PNF = Payette National Forest; RO = Regional Office; R1 = Northern Regional Office; R4 = Intermountain Regional Office; ret = retired; WO = Washington DC Office

Table 6.4-2  Cooperating Agencies

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<tr>
<th>Agency</th>
<th>Point of Contact</th>
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<tbody>
<tr>
<td>United States Army Corp of Engineers Walla Walla District  Boise Regulatory Office  720 Park Boulevard, Suite 245 Boise, Idaho 83712</td>
<td>Christen Marve Griffith, Regulatory Project Manager</td>
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<tr>
<td>Idaho Department of Environmental Quality 1445 North Orchard Street Boise, Idaho 83706</td>
<td>Aaron Scheff, Boise Regional Office Administrator</td>
</tr>
<tr>
<td>Idaho Department of Lands Payette Lakes Area Office 555 Deinhard Lane McCall, Idaho 83638</td>
<td>Diane Green, Regulatory/Reclamation</td>
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<tr>
<td>Governor’s Office of Energy and Mineral Resources 304 North 8th Street, Suite 250 Boise, Idaho 83702</td>
<td>George Lynch, Minerals Policy Analyst</td>
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<td>Agency</td>
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<tr>
<td>Valley County</td>
<td>Elt Hasbrouck, Commissioner</td>
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<td>Valley County Commission</td>
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<tr>
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<tr>
<td>Cascade, Idaho 83611</td>
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Table 6.4-3  Third Party EIS Preparers – Stantec Consulting Services Inc.

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<th>Contributor</th>
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<th>Qualifications</th>
<th>Years of Experience</th>
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</table>
| Brian Buck             | Principal-In-Charge, NEPA Process, geology, hazardous materials | B.S., Geology  
M.S., Geological Engineering                                                   | 46                  |
M.S., Applied Mathematics  
Ph.D., Applied Mathematics                                                     | 26                  |
| Greg Brown             | Assistant Project Manager, Scenic Resources          | B.S., Natural Resource Management (Wildlife Emphasis)                         | 30                  |
| Jenni Prince Mahoney   | Lead Author, Heritage Resources, Tribal Rights and Interests, Recreation | B.A., Anthropology  
Graduate Certificate, NEPA                                                      | 30                  |
| Ben Veach              | Project Administrator, Noise, Transportation, Land Use & Management | B.S., Forestry                                                              | 36                  |
| Stephanie Theis        | Fisheries                                             | B.S., Fisheries Ecology  
Graduate Education in Applied Ecology and Conservation Biology - Fish          | 32                  |
| Matt Brekke            | Botanical Resources, Wildlife                        | B.S., Wildlife Biology; Minor: Fishery Biology                               | 16                  |
| Melany Gagliardi       | Administrative Record, Public Involvement             | A.A., Accounting                                                            | 10                  |
| Cory Bolen             | GIS Team Lead                                         | B.S., Forest Resources – Ecosystem Management  
M.S., Forest Sciences w/emphasis in Geographic Information Systems (GIS), Ecology and Spatial Statistical Modeling | 20                  |
| Dave Kikkert           | Wetlands                                              | B.S., Fisheries and Wildlife  
M.S., Ecology                                                                   | 20                  |
| Eric Clark             | Air Quality, Climate Change                          | B.S., Environmental Science  
M.S., Civil Engineering                                                         | 16                  |
| Haley Barnes           | Administration                                        | B.S., Range Management                                                       | 6                   |
| Ellen Brady            | Heritage Resources, Programmatic Agreement            | B.S., Anthropology  
M.A., Anthropology                                                              | 25                  |
<p>| Sierra Marke           | Soils, Special Designations, Recreation, Noise        | B.A., Geology - Environmental Science                                         | 2                   |</p>
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<tr>
<td>Jen Sojka</td>
<td>Social and Economic Resources</td>
<td>B.A., Biology</td>
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<td>M.S., Biological Sciences</td>
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<tr>
<td>Shelby Hockaday</td>
<td>Scenic Resources, Transportation</td>
<td>B.S., Earth Sciences: Geography</td>
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<td>M.S., Geography</td>
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<tr>
<td>Jessica Jarvis</td>
<td>GIS</td>
<td>B.A., Environmental Studies</td>
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<tr>
<td>Chris Johnson</td>
<td>GIS</td>
<td>B.S., Geology</td>
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<tr>
<td>Jason Trook</td>
<td>GIS</td>
<td>B.A., Anthropology</td>
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### Table 6.4-4 Third Party EIS Preparers - Subcontractors

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<tr>
<td>Derek Risso</td>
<td>Ecosystem Sciences</td>
<td>Fish Resources and Fish Habitat, Stream Restoration, Fisheries, Water Rights and Resources</td>
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<td></td>
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<td>B.A. Environmental Studies</td>
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<td>M.S. Fisheries and Wildlife Science</td>
<td></td>
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<tr>
<td>Zach Herzfeld</td>
<td>Ecosystem Sciences</td>
<td>Fish Resources and Fish Habitat</td>
<td>12</td>
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<tr>
<td></td>
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<td>B.A. International Business/Spanish</td>
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<td>M.S. Geography</td>
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<tr>
<td>Tim Maguire</td>
<td>Ecosystem Sciences</td>
<td>Fish Resources and Fish Habitat</td>
<td>25</td>
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<tr>
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<tr>
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<td></td>
<td>M.S. Geography</td>
<td></td>
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<tr>
<td>Kristi Schaff</td>
<td>Nexus Environmental Consultants</td>
<td>NEPA documentation</td>
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<td></td>
<td></td>
<td>B.S., Land Rehabilitation with a minor in Soils</td>
<td>18</td>
</tr>
</tbody>
</table>

### 6.5 Mailing List

#### 6.5.1 Federal Agencies

- Acquisition and Serials Branch
- Forest Service, Boise National Forest
- Forest Service, Cascade Ranger District
- Forest Service, Intermountain Regional Office
- Forest Service, Payette National Forest
- Forest Service, Salmon-Challis National Forest
- National Oceanic Atmospheric Administration, National Marine Fisheries Service
- Office of Environmental Policy and Compliance
- United States Army Corps of Engineers
- United States Bureau of Reclamation
- United States Department of Justice
- United States Environmental Protection Agency
- United States Fish and Wildlife Services
6.5.2 State Agencies

- Idaho Congressional Representatives
- Idaho Department of Commerce
- Idaho Department of Environmental Quality
- Idaho Department of Fish and Game
- Idaho Department of Labor
- Idaho Department of Lands
- Idaho Department of Water Resources
- Idaho Governor’s Office of Energy and Mineral Resources (OEMR)
- Idaho House of Representatives
- Idaho State Historic Preservation Office
- Idaho State Historical Society
- Idaho State Senate
- Office of Governor Brad Little

6.5.3 Tribes

- Nez Perce Tribe
- Shoshone-Bannock Tribes
- Shoshone-Paiute Tribes

6.5.4 Local Government

- Ada County Commissioners
- Adams County Commissioners
- Boise County Commissioners
- Cascade Chamber of Commerce
- Cascade School District #422
- City of Cascade
- City of Donnelly
- City of McCall
- Valley County Board of County Commissioners

6.5.5 Organizations and Businesses

- 8th Street Marketplace
- Academy Mortgage
- Advocates for the West
- Alliance for the Wild Rockies
- American Exploration & Mining Association
- Ameriben
- Amerigas Propane
- Backcountry Recreation Club
- Blue Ribbon Coalition
• Bob Bate Ford
• Boise Valley Fly Fisherman
• Cascade Medical Center
• Center for Biological Diversity
• Columbia River Inter-Tribal Fish Commission
• Deadwood Outfitters
• Donnelly Rural Fire Protection District
• Elk Springs Outfitters
• Fly Fishers of Idaho
• Formation Capital Team
• Golden Eagle Audubon
• Golden Predator
• Granite Excavation, Inc.
• Greater Garden Valley Areas Chamber of Commerce
• Hecla Mining Company
• Idaho Association of Commerce & Industry
• Idaho ATV Association
• Idaho Chapter, United Women Entrepreneurs
• Idaho Conservation League
• Idaho First Bank
• Idaho Junior Steelheads
• Idaho Mining Association
• Idaho Outfitters and Guides
• Idaho Power Company
• Idaho Recreation Council
• Idaho Rivers United
• Idaho State Bowhunters
• Idaho Whitewater Association
• Idaho Wildlife Federation
• IDAK Consulting Inc.
• Intermountain Forest Association
• Ivy Minerals, Inc.
• Jerry’s Auto Parts
• JJO LLC
• J.R. Simplot Company
• Juniper Mountain Outfitters
• Kniefel Insurance
• Leavitt & Associates Engineers Inc.
• May Security
• McCall Area Snowmobile Club
• Midas Gold Idaho, Inc.
• Mile High Power Sports
• Mining Minnesota
• Mink Geohydro Inc.
• Monsanto
• Norell Ranch
• Northwest Whitewater
• Outsider Club
• Pistol Creek Outfitters
• Press in the Pines
• Rocky Mountain Elk Foundation
• Rocky Mountain Signs
• ROSE Advocates
• Sierra Club – Idaho Chapter
• Sulphur Creek Ranch Outfitters
• Teck America Incorporated
• The Cascade Store Employees and Owners
• The Lilypad, LLC
• The McCall Candy Company LLC
• The McCall Store LLC
• The Nature Conservancy
• The Wilderness Society
• Treasure Valley Backcountry Horsemen
• Treasure Valley Trail Machine Association
• Trout Unlimited
• Valley Soil & Water Conservation District
• Wapiti Meadows Ranch
• Warm Lake Users Association
• West Mountain Snowmobile Club
• Western Lands Project
• Western State Equipment Company
• Winter Wildlands Alliance
• Women’s Mining Coalition
• Yellow Pine Fire Protection District
• Yellow Pine General Store
• Zena Creek Ranch

6.5.6 Individuals
Notifications of the availability of the SDEIS also were sent to over 1,900 individuals via email and hardcopy letter.
7.0 REFERENCES, ACRONYMS, GLOSSARY, AND INDEX

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### 7.2 Acronyms and Abbreviations

- °C degrees Celsius
- °F degrees Fahrenheit
- µg/L micrograms per liter
- µg/m²-yr micrograms per square meter per year
- µg/m³ micrograms per cubic meter
- 2021 MMP 2021 Modified Mine Plan
- AA assessment area
- AAC acceptable ambient non-carcinogenic concentration
- AACC acceptable ambient carcinogenic concentration
- AADT annual average daily traffic
- AASHTO American Association of State Highway and Transportation Officials
- ABA Acid-base accounting
- AC Alternating Current
- ACHP Advisory Council on Historic Preservation
- AECOM AECOM Technical Services, Inc.
- AERMOD American Meteorological Society/Environmental Protection Agency Regulatory Model
- AHI Avalanche Hazard Index
- amsl above mean sea level
 CCC  criterion continuous concentration
CCD  Census County Subdivision
CE  categorical exclusion
CEA  cumulative effects analysis area
Census  U.S. Census Bureau
CEQ  Council on Environmental Quality
CERCLA  Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS  Comprehensive Environmental Response, Compensation and Liability Information System
CFR  Code of Federal Regulations
cfs  cubic feet per second
CH₄  methane
CIL  carbon in-leach
CIP  carbon in-pulp
CL  cultural landscape
Cl-  chloride
CMC  criterion maximum concentration
CMP  Conceptual Mitigation Plan
CO  carbon monoxide
CO₂  carbon dioxide
CO₂eq  carbon dioxide equivalent
COLD  cold water aquatic life
CR  County Road
CRMO  Craters of the Moon National Monument
CS  Chinook Salmon
CTB  Centennial Tectonic Belt
cTH  typic halsoparists
CUP  Conditional Use Permit
CWA  Clean Water Act
DA  Department of the Army
DAC  Dynamic Avalanche Consulting
DAT  Deposition Analysis Thresholds
<table>
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<tr>
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<td>dB</td>
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<td>dBA</td>
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<td>environmental DNA</td>
</tr>
<tr>
<td>EFH</td>
<td>essential fish habitat</td>
</tr>
<tr>
<td>EFMC</td>
<td>East Fork Meadow Creek</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>EMF</td>
<td>electromagnetic field</td>
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<tr>
<td>EMMP</td>
<td>Environmental Monitoring and Management Plan</td>
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<tr>
<td>EO</td>
<td>Executive Order</td>
</tr>
<tr>
<td>EOY</td>
<td>end of mine year</td>
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<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
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<td>EPCRA</td>
<td>Emergency Planning and Community Right to Know Act</td>
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<td>ESA</td>
<td>Endangered Species Act</td>
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<td>ESS</td>
<td>Ecosystem Sciences, LLC</td>
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<tr>
<td>FA</td>
<td>functioning appropriately</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
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<tr>
<td>FCRNRW</td>
<td>Frank Church River of No Return Wilderness</td>
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<td>FEIS</td>
<td>Final Environmental Impact Statement</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
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<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>fOD</td>
<td>frigid oyaquic dystrocryepts</td>
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<td>FOMP</td>
<td>Fishway Operations and Management Plan</td>
</tr>
<tr>
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<td>U.S. Department of Agriculture Forest Service</td>
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<tr>
<td>FR</td>
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<td>FR</td>
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<td>FRTA</td>
<td>Forest Roads and Trails Act</td>
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<tr>
<td>FSH</td>
<td>Forest Service Handbook</td>
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<td>FSM</td>
<td>Forest Service Manual</td>
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<td>FTA</td>
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<tr>
<td>fTH</td>
<td>frigid typic haplosapristis</td>
</tr>
<tr>
<td>FUR</td>
<td>Functioning at Unacceptable Risk</td>
</tr>
<tr>
<td>g/ha-yr</td>
<td>grams per hectare-year</td>
</tr>
<tr>
<td>GCL</td>
<td>geosynthetic clay liner</td>
</tr>
<tr>
<td>GDE</td>
<td>groundwater dependent ecosystem</td>
</tr>
<tr>
<td>GHG</td>
<td>greenhouse gas</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GM</td>
<td>growth material</td>
</tr>
<tr>
<td>GMM</td>
<td>ground motion models</td>
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<tr>
<td>GMS</td>
<td>growth media stockpile</td>
</tr>
<tr>
<td>GMU</td>
<td>game management unit</td>
</tr>
<tr>
<td>GOSPEL</td>
<td>Gospel Hump</td>
</tr>
<tr>
<td>gpd</td>
<td>gallons per day</td>
</tr>
<tr>
<td>gpm</td>
<td>gallons per minute</td>
</tr>
<tr>
<td>GPS</td>
<td>global positioning system</td>
</tr>
<tr>
<td>H:V</td>
<td>horizontal to vertical</td>
</tr>
<tr>
<td>H+</td>
<td>free acidity</td>
</tr>
<tr>
<td>H₂SO₄</td>
<td>sulfuric acid mist</td>
</tr>
<tr>
<td>HAC</td>
<td>hot arsenic cure</td>
</tr>
<tr>
<td>HAP</td>
<td>Hazardous Air Pollutant</td>
</tr>
<tr>
<td>HCN</td>
<td>hydrogen cyanide</td>
</tr>
<tr>
<td>HCT</td>
<td>humidity cell test</td>
</tr>
</tbody>
</table>
HDPE  high-density polyethylene
HDR  HDR Engineering, Inc.
HECA  Hells Canyon Wilderness
Hecla  Hecla Mining Company
HEMBLD  Hemingway-Boulders
HFC  hydrofluorocarbon
Hg  mercury
HNO₃  nitric acid
HPMP  Historic Properties Management Plan
HPTP  Historic Properties Treatment Plan
HRV  historical range of variability
HUC  Hydrologic Unit Code
HV  Heavy Vehicle
ICCNAC  Idaho Centennial Commission Native Americans Committee
ICMC  International Cyanide Management Code
ICT  Idaho Centennial Trail
ICTRT  Interior Columbia Technical Recovery Team
IDAPA  Idaho Administrative Procedures Act
IDEPQ  Idaho Department of Environmental Quality
IDFG  Idaho Department of Fish and Game
IDHW  Idaho Department of Health and Welfare
IDL  Idaho Department of Lands
IDWR  Idaho Department of Water Resources
IMPLAN  A company that specializes in economic impact data and analytical software
IMPROVE  Interagency Monitoring of Protected Visual Environments
IOGLB  Idaho Outfitters and Guides Licensing Board
IP  Intrinsic Potential
IPCC  Intergovernmental Panel on Climate Change
IPCo  Idaho Power Company
IPDES  Idaho Pollutant Discharge Elimination System
ips  inches per second
IRA  Inventoried Roadless Area
IRMA  Initiative for Responsible Mining Assurance
ISDA  Idaho State Department of Agriculture
ISO  International Organization for Standardization
ITD  Idaho Transportation Department
K  potassium
kg  kilogram
kg/ha-yr  kilograms per hectare per year
km  kilometer
kPa  kilopascal
KOP  key observation point
kV  kilovolt
LANDFIRE  Landscape Fire and Resource Management Planning Tools Project
LAU  Lynx Analysis Unit
lbs/ft²  pounds per square foot
LCAS  Lynx Conservation Assessment and Strategy
L_{DN}  day-night noise level
L_{EQ}  Equivalent sound level
L_{EQ1h}  Average hourly noise level
LOM  Life-of-Mine
LS  limestone
LV  light vehicle
m³  cubic meter
MA  Management Area
Ma  million years ago
MBF  thousand board feet
MBR  membrane bioreactor
MBTA  Migratory Bird Treaty Act
MCE  Maximum Credible Earthquake
MCFZ  Meadow Creek Fault Zone
MCL  maximum contaminant level
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mCP</td>
<td>typic cryopsamments</td>
</tr>
<tr>
<td>MDN</td>
<td>Mercury Deposition Network</td>
</tr>
<tr>
<td>MeHg</td>
<td>methylmercury</td>
</tr>
<tr>
<td>Mg</td>
<td>Magnesium</td>
</tr>
<tr>
<td>mg</td>
<td>milligram</td>
</tr>
<tr>
<td>mg/kg</td>
<td>milligrams per kilograms</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligrams per liter</td>
</tr>
<tr>
<td>Midas Gold</td>
<td>Midas Gold Idaho, Inc.</td>
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<tr>
<td>Mining Law</td>
<td>General Mining Law of 1872</td>
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<tr>
<td>MIS</td>
<td>Management Indicator Species</td>
</tr>
<tr>
<td>ML</td>
<td>Maintenance Level</td>
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<tr>
<td>MMBtu</td>
<td>Million British thermal units</td>
</tr>
<tr>
<td>MMT</td>
<td>million metric ton</td>
</tr>
<tr>
<td>ModPRO</td>
<td>revised Plan of Restoration and Operations</td>
</tr>
<tr>
<td>ModPRO2</td>
<td>modified Plan of Restoration and Operations</td>
</tr>
<tr>
<td>MPC</td>
<td>management prescription category</td>
</tr>
<tr>
<td>MPG</td>
<td>major population group</td>
</tr>
<tr>
<td>mph</td>
<td>miles per hour</td>
</tr>
<tr>
<td>MRR</td>
<td>Mandatory Reporting of Greenhouse Gas Rule</td>
</tr>
<tr>
<td>MRS</td>
<td>Minimum Road System</td>
</tr>
<tr>
<td>MSGP</td>
<td>Multi-Sector General Permit</td>
</tr>
<tr>
<td>MSHA</td>
<td>Mine Safety and Health Administration</td>
</tr>
<tr>
<td>MT</td>
<td>metric ton</td>
</tr>
<tr>
<td>mTC</td>
<td>mixed typic cryorthents</td>
</tr>
<tr>
<td>MW</td>
<td>megawatt</td>
</tr>
<tr>
<td>MWAM</td>
<td>Montana Wetland Assessment Method</td>
</tr>
<tr>
<td>MWh</td>
<td>megawatt hour</td>
</tr>
<tr>
<td>MWMP</td>
<td>Meteoric Water Mobility Procedure</td>
</tr>
<tr>
<td>N</td>
<td>Nitrogen</td>
</tr>
<tr>
<td>N/A or NA</td>
<td>not available/applicable</td>
</tr>
<tr>
<td>N₂O</td>
<td>nitrous oxide</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>NRHP</td>
<td>National Register of Historic Places</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resource Manager</td>
</tr>
<tr>
<td>NSHM</td>
<td>National Seismic Hazards Map</td>
</tr>
<tr>
<td>NSPS</td>
<td>New Source Performance Standards</td>
</tr>
<tr>
<td>NSR</td>
<td>Noise Sensitive Receiver</td>
</tr>
<tr>
<td>NTCRA</td>
<td>Non-Time Critical Removal Action</td>
</tr>
<tr>
<td>NTN</td>
<td>National Trends Network</td>
</tr>
<tr>
<td>NTU</td>
<td>Nephelometric Turbidity Unit</td>
</tr>
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<td>NWPS</td>
<td>National Wilderness Preservation System</td>
</tr>
<tr>
<td>NWS</td>
<td>National Weather Service</td>
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<tr>
<td>O&amp;M</td>
<td>operations and management</td>
</tr>
<tr>
<td>O₃</td>
<td>ozone</td>
</tr>
<tr>
<td>OEMR</td>
<td>Idaho Governor's Office of Energy and Mineral Resources</td>
</tr>
<tr>
<td>OHV</td>
<td>off-highway vehicle</td>
</tr>
<tr>
<td>OHWM</td>
<td>ordinary high-water mark</td>
</tr>
<tr>
<td>OM</td>
<td>occupancy modeling</td>
</tr>
<tr>
<td>ORV</td>
<td>Outstandingly Remarkable Value</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<tr>
<td>OSV</td>
<td>over-snow vehicle</td>
</tr>
<tr>
<td>P.L.</td>
<td>Public Law</td>
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<tr>
<td>PA</td>
<td>Programmatic Agreement</td>
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<td>PAB</td>
<td>palustrine aquatic bed</td>
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<tr>
<td>PAG</td>
<td>potentially acid generating</td>
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<tr>
<td>Payette Forest Plan</td>
<td>Payette National Forest Land and Resource Management Plan</td>
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<tr>
<td>Pb</td>
<td>lead</td>
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<tr>
<td>PCR</td>
<td>primary contact recreation</td>
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<tr>
<td>PEM</td>
<td>palustrine emergent marsh</td>
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<tr>
<td>Perpetua</td>
<td>Perpetua Resources Ltd.</td>
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<tr>
<td>PFC</td>
<td>perfluorocarbon</td>
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<tr>
<td>PFO</td>
<td>palustrine forested</td>
</tr>
<tr>
<td>PGA</td>
<td>peak ground acceleration</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td>PGM</td>
<td>photochemical grid modeling</td>
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<tr>
<td>PHABSIM</td>
<td>Physical Habitat Simulation System</td>
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<tr>
<td>PIBO</td>
<td>PACFISH/INFISH Biological Assessment</td>
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<td>PIF</td>
<td>Partners in Flight</td>
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<tr>
<td>Pioneer</td>
<td>Pioneer Metals Corporation</td>
</tr>
<tr>
<td>Plan</td>
<td>modified Plan of Restoration and Operations</td>
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<tr>
<td>PM</td>
<td>particulate matter</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>particulate matter with an aerodynamic diameter of 10 microns or less</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>particulate matter with an aerodynamic diameter of 2.5 microns or less</td>
</tr>
<tr>
<td>PMU</td>
<td>Population Management Unit</td>
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<tr>
<td>PNF</td>
<td>Payette National Forest</td>
</tr>
<tr>
<td>POD</td>
<td>Plan of Development</td>
</tr>
<tr>
<td>POI</td>
<td>probability of instability</td>
</tr>
<tr>
<td>ppb</td>
<td>parts per billion</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>PPV</td>
<td>peak particle velocity</td>
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<tr>
<td>PRISM</td>
<td>Parameter-Elevation Regressions on Independent Slopes Model</td>
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<tr>
<td>Project</td>
<td>Stibnite Gold Project</td>
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<tr>
<td>PRSB</td>
<td>Payette River Scenic Byway</td>
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<tr>
<td>PSD</td>
<td>Prevention of Significant Deterioration</td>
</tr>
<tr>
<td>PSHA</td>
<td>probabilistic seismic hazard analysis</td>
</tr>
<tr>
<td>PSS</td>
<td>palustrine scrub-shrub</td>
</tr>
<tr>
<td>PTC</td>
<td>Permit to Construct</td>
</tr>
<tr>
<td>PVG</td>
<td>Potential Vegetation Group</td>
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<tr>
<td>RAMP</td>
<td>Restoration and Access Management Plan</td>
</tr>
<tr>
<td>RCA</td>
<td>Riparian Conservation Area</td>
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<tr>
<td>RCM</td>
<td>reclamation cover material</td>
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<td>RCNM</td>
<td>Roadway Construction Noise Model</td>
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<td>RCP</td>
<td>Representative Concentration Pathways</td>
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<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
</tr>
<tr>
<td>RFAI</td>
<td>Request for Additional Information</td>
</tr>
</tbody>
</table>
RFFA Reasonably Foreseeable Future Action
Rio ASE Rio Applied Science and Engineering
RNA Research Natural Area
ROD Record of Decision
ROS Recreation Opportunity Spectrum
ROW right-of-way
S45+ sandy-skeletal/loamy-skeletal, mixed typic cryorthents
S Sulfur
SAG semi-autogenous grinding
SAWT Sawtooth Wilderness
SBM seed bank material
SCR secondary contact recreation
SDEIS Supplemental Draft Environmental Impact Statement
SELW Selway-Bitterroot Wilderness
SF₆ sulfur hexafluoride
SFSR South Fork Salmon River
SGCN Species of Greatest Conservation Need
SGLF Stibnite Gold Logistics Facility
SGP Stibnite Gold Project
SH State Highway
SHA seismic hazard analysis
SHPO State Historic Preservation Office
SIL Significant Impact Level
SIP State Implementation Plan
SMU Soil map unit
SNOTEL Snow Telemetry
SO₂ sulfur dioxide
SO₄ sulfate
SODA Spent Ore Disposal Area
SOPA Schedule of Proposed Actions
SPCC Spill Prevention, Control and Countermeasure
USGS  U.S. Geological Survey
UTM  Universal Transverse Mercator
UTV  utility task vehicle
VAV  Visual, Auditory, and Vibratory
VCMQI  Vegetation Classification Mapping and Quantitative Inventory
VHF  very high frequency
VISCREEN  EPA visibility impairment screening model
VMS  Visual Management System
VOC  volatile organic compounds
vpd  vehicles per day
VQO  Visual Quality Objective
WAD  weak acid dissociable
WCI  Watershed Condition Indicators
WCS  Wildlife Conservation Strategy
WEFZ  West End Fault Zone
WHTCLD  Cecil D. Andrus—White Clouds
WOTUS  waters of the United States
WQBEL  Water Quality Based Effluent Limitation
WRCC  Western Regional Climate Center
WSC  westslope cutthroat trout
WSR  Wild and Scenic River
WTP  Water Treatment Plant
WUA  Weighted Useable Area
YP  Yellow Pine Pit
YWAM  Youth with a Mission

7.3  **Glossary**

A-run fish – Snake River steelhead that return to a stream after one year in the ocean.

Abiotic – Physical rather than biological; not derived from living organisms.

Acid rock drainage – The outflow of acidic water from metal mines (or coal mines) derived from the oxidation of sulfide minerals in rock.
Adaptive Management – A type of natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves testing, monitoring, evaluation, and incorporating new knowledge into management approaches based on scientific findings and the needs of society (Forest Service 2003).

Adit – A horizontal or near horizontal passage leading into an underground mine for the purposes of access or draining.

Alaskite – A granitic rock composed of quartz and alkali feldspars.

Alkalinity – A chemical measurement of a water’s ability to neutralize acids.

Alluvial/Alluvium – A deposit of clay, silt, sand, and gravel left by flowing streams in a river valley.

Antimony – Natural element with the symbol Sb and atomic number 51; a lustrous gray metalloid in native form; used in batteries, munitions, fire retardants, and ball bearings, among others.

Aquifer – A water-bearing layer of rock, sand, or gravel.

Aquifer cross-flow – Vertical groundwater flow from one part of a body of rock to another.

Arsenic - Natural element with the symbol As and atomic number 33; a metallic element with a steel grey appearance in native form.

Arterial Road – An NFS road that provides service to large land areas and usually connects with other arterials roads or public highways.

Autoclave – A vessel used to carry out industrial processes requiring elevated temperature and pressure relative to ambient air temperature and pressure.

B-run fish – Snake River steelhead that return to a stream after two to four years in the ocean.

Backfill – Material used to fill a void created by mining.

Ball Mill – A type of mechanical fine grinder that uses a horizontal rotating cylinder partially filled with balls, usually metal, which grinds material to a specified particle size by friction and impact with the tumbling balls.

Bankfull – The water level at which a stream, river or lake is at the top of its banks and any further rise would result in water overtopping a bank and moving into the flood plain.

Bedrock – Solid rock underlying unconsolidated surface materials, such as gravel, soil, or alluvium.

Bench – In open pit mines and quarries, the ledge which forms a single level of operation where ore and/or development rock is excavated.

Benthic – Pertaining to the bottom of a body of water.
Bentonite – A soft, plastic, light-colored clay formed by chemical alteration or volcanic ash.

Berm – An artificial ridge or embankment constructed of soil or rock to limit the movement of people or equipment across a certain line or border.

Biota – Living material. The flora and fauna of an area (Forest Service 2003).

Boreal – Northern, cold habitat areas with conifer trees.

Borrow material – Rock, gravel and sand, typically excavated from one area to be used as fill material in another area (especially road construction).

Burntlog Route – The proposed mine access route for operations and reclamation under the 2021 MMP. Burntlog Route would start at Landmark on Burnt Log Road (FR 447) and continue on Burnt Log Road until it ends. Approximately 15 miles of new road would be constructed to connect the existing Burnt Log Road to Meadow Creek Lookout Road (FR 51290) and then new road to connect to Thunder Mountain Road (FR 50375) and into the Operations Area Boundary past the proposed worker housing facility.

Calc-silicate – A metamorphic rock consisting mainly of calcium-bearing silicate minerals such as diopside and wollastonite; formed by metamorphism of impure limestone or dolomite.

Candidate species – Plant and animal species being considered for listing as endangered or threatened, in the opinion of the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). Category 1 candidate species are groups for which the FWS or NMFS has sufficient information to support listing proposals; category 2 candidate species are those for which available information indicates a possible problem, but that need further study to determine the need for listing (Forest Service 2003).

Canopy cover – Total non-overlapping cover of all trees in a vegetative unit excluding the seedling size class. Trees in the seedling size class are used to estimate canopy cover only when they represent the only structural layer on the site (Forest Service 2003).

Cessation – Temporary or complete stopping.

Cherry Stem Roads – Roads that extend into an Inventoried Roadless Area or wilderness area are called cherry stemmed roads because the boundary resembles a cherry stem.

Cirque – A bowl-shaped valley produced by glacial action in high mountains.

Closure - The processes undertaken during construction and operations (concurrent closure), during temporary cessation of operations (interim closure), and when the operational stage of a mine has ended (final closure) to decommission operational activities and rehabilitate the ground surface to its intended post-mining land use, usually in conformity with a predetermined Land Management Plan or government approved plan or permit.

Collar – The surface at the top of a shaft or decline; or the start of a drill hole.
Collector Road – An NFS road that serves smaller areas than an arterial road and that usually connects arterial roads to local roads or terminal facilities.

Colluvium – Unconsolidated sediments that have been deposited at the base of hillslopes by either rainwash, sheetwash, slow continuous downslope creep, or a combination of these processes.

Concentrate – The valuable fraction of ore that is left after non-economic rock material is removed in processing. This material is what is sent for further processing, usually to a refinery or smelter.

Concurrent closure – Closure completed during the active construction and operations stages of a mining project.

Concurrent reclamation – Reclamation completed during active construction and operations.

Confined Aquifer – An aquifer below the land surface that is saturated with water. Layers of impermeable material are both above and below the aquifer.

Conifer – Trees with needle-like foliage and seeds borne in cones.

Contact Water – Water that has come in contact with disturbed and/or mining materials and could pick up pollutants and have a potential to carry these pollutants to groundwater or surface water.

Contouring – Reshaping ground material into a final landform.

Conveyor – Mechanical infrastructure, generally electrically driven, which extends from a receiving point to a discharge point and conveys, transports, or transfers material between those points.

Core – Cylindrical samples of rock removed from a drill hole for analysis.

Cultural Landscape - A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes (Forest Service 2015; NPS 2020).

Cumulative effects – Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (Forest Service 2003).

Cyanide – A naturally occurring organic compound composed of carbon and nitrogen (CN). The solid chemical compound, sodium cyanide (NaCN), is dissolved in water to form a solution suitable for the extraction of gold and silver from ore by using a leaching process.

Cyanidation – A type of ore processing facility where prepared ore is exposed to aqueous cyanide under a set of specific, controlled conditions to extract gold and silver.
dBa – Noise measurement scale (decibels) that is A-weighted (i.e., decibel values of sounds at low frequencies are reduced, compared with unweighted decibels, in which no correction is made for audio frequency).

Debris flow – A mass of soil and/or fragmented rock in slurry of water that moves downslope under the influence of gravity and forms muddy deposits in valley floors.

Decant – To draw off a liquid so as not to disturb the sediment, with the goal being to separate water from sediment and fines.

Decline – A sloped passageway from the surface to where a mineral deposit is located, large enough to allow workers and equipment to access the mineral.

Degradation – To measurable change a resource condition for the worse within and identified scale and time frame. Where existing conditions are within the range of desired conditions, “degrade” means to move the existing condition outside of the desired range. Where existing conditions are already outside the range of desired conditions, “degrade” means to change the existing condition to anything measurably worse. The term “degrade” can apply to any condition or condition indicator at any scale of size or time, but those scales need to be identified. This definition of “degrade” is not intended to define degradation for the State of Idaho as it applies to their Antidegradation Policy (IDAPA 16.01.02.051) (Forest Service 2003).

Delineate – To mark the outlines of and/or to describe, portray, or set forth with accuracy or in detail.

Denning habitat or sites – Habitat and locations used by mammals during reproduction and rearing of their young, when the young are highly dependent on adults for survival (Forest Service 2003).

Deposit – An accumulation of natural resources, such as gold and silver, other minerals, metals, coal, oil, gas, etc. that may be pursued for its intrinsic value; e.g., a gold and silver deposit.

Deposition – Physical mechanisms, which can be either wet or dry, that convey airborne pollutants to soil and surface water.

Design feature – Is an impact-reducing action or design that Perpetua has committed to in their Plan of Restoration and Operations and supporting documents.

Desired Condition (DC/DFC) – Also called Desired Future Condition (DFC), a portrayal of the land, resource, or social and economic conditions that are expected in 50-100 years if management goals and objectives are achieved. A vision of the long-term conditions of the land (Forest Service 2003).

Development Rock – The rock that must be removed and disposed of to gain access to and excavate ore. Development rock typically contains no commercial antimony, gold or silver values. See also: waste rock.

Discharge – The volume of water flowing past a point per unit time; commonly expressed as cubic feet per second (cfs) or gallons per minute (gpm).
Dissolved oxygen – The amount of free oxygen dissolved in water, expressed in milligrams per liter (mg/L), parts per million (ppm), or in percent of saturation, i.e., with saturation reported relative to the maximum amount of oxygen that can theoretically be dissolved in water at a particular altitude and temperature.

Drainage basin – An extent or an area of land from which surface water runoff from rain and melting snow or ice converges to a single point, usually the exit of the basin, where the waters join another waterbody, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.

Drill hole – A cylindrical hole advanced into the subsurface to retrieve and examine/analyze material for the purpose of mineral exploration, geotechnical characterization, or to construct a well.

Drill jumbo – A drilling jumbo consists of one, two or three rock drill carriages, sometimes a platform, which the miner stands on to load the holes with explosives that clears the face of the tunnel.

Drilling fluid – Water and biodegradable, synthetic polymer mud products used to suspend and remove cuttings, maintain hole stability, minimize formation damage, and cool and lubricate the drilling bit and assembly during drilling.

Drill pad – A leveled location from which a drilling rig may advance one or more drill holes.

Drill rig – A diesel-powered machine used to cut the drill holes and retrieve samples and may be used to construct a well in the drill hole.

Doré – A metal alloy bar with gold content that ranges from 60 to 95 percent of gold. Doré would be produced at the mine site and then shipped offsite for further refining.

Embankment – A linear structure, usually constructed of earth or rock, extending above the natural ground surface to retain water or tailings.

Energy Dissipaters – Structures, usually built of rock or concrete, to disrupt and steady the flow of water; frequently constructed in stream channels, drainage ditches, or spillways.

Enhancement – The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area (CWA Section 404).

Environmental Justice – Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EO 12898 states, “Each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.”
Ephemeral stream – A stream or portion of a stream that flows only in direct response to precipitation or run-off events, and that receives little or no continuous water from springs, snow, or other sources. Unlike intermittent streams, an ephemeral usually does not have a defined stream channel or banks, and its channel is at all times above the water table (Forest Service 2003).

Equalization tanks – Holding tanks that allow for provision of steadier outflow with variable inflow.

Erosion – The wearing away of the land surface by running water, wind, ice or other geologic processes.

Escape Raise – A raise refers to a vertical or inclined excavation that leads from one level of the underground mine to another underground. An escape raise is a method of exit from underground workings which people can access safely in an emergency such as a fire, spill, underground instability, or similar emergency.

Evapotranspiration – The process by which water is transferred from the land to the atmosphere by evaporation from waterbodies, soil, and other surfaces and by transpiration from plants.

Exploration – The search for deposits of valuable minerals using a variety of methods that can include drilling, sampling, remote sensing, and mining.

Factor of safety – The safety margin and is calculated by the strength of the resisting forces divided by the strength of the stress imparted to the feature/structure (in this case, the TSF dam).

Fault – A geologic term for a fracture in the Earth’s crust, which has experienced movement.

Fault gouge – finely crushed and ground-up rock produced by the friction of movement between two sides of a fault.

Fauna – Animals characteristic of a region, period, or special environment.

Fill Material – Soil or rock fragments used to raise the surface of low - lying land.

Filtrate – The liquid that has passed through a filter.

Final Closure – The process undertaken when the operational stage of a mine has ended, and the final decommissioning and mine rehabilitation is underway.

Final Reclamation – The rehabilitation of the post-mining landscape to its intended post-mining land use, usually in conformity with a predetermined Land Management Plan or government approved plan or permit.

Final Closure and Reclamation – The final process and activities that facilitate cessation of operations and return of disturbed land to its intended post-mining land use, usually in conformity with a predetermined Land Management Plan or government approved plan or permit.
Financial Guarantee – A financial instrument that guarantees repair of surface resource disturbance, equipment removal, waste disposal, and similar actions. Where more than one agency, federal and/or state, has jurisdiction over a mineral operation, the role of each agency should be defined in a cooperative agreement (FSM 2846). May be secured with cash as a last resort, but preferably credit/debit cards or electronic check processing, corporate surety, deposited securities, an irrevocable letter of credit, or assignment of savings account or certificate of deposit. Individual sureties are unacceptable as reclamation bonds; however, individual sureties can be used for post-reclamation long term work. The penal sum of the instrument must at least equal the cost estimated by the Forest Service to complete reclamation.

Fishway – A group of facilities, structures, devices, measures, and project operations that together constitute, and are essential to the success of, an upstream or downstream fish passage system.

Flash Vessel – A vessel used to contain evaporation (flash) that occurs by passing a liquid stream through a pressure reduction device, known as a throttling device, at the entrance to the vessel.

Flocculent – A substance that promotes the clumping of particles to facilitate separation or settling of solids from a liquid.

Flora – Plant or bacterial life characteristic of a region, period, or special environment.

Flotation – The process of separating small particles of various materials by treatment with chemicals in water in order to make some particles adhere to air bubbles and rise to the surface for removal while others remain in the water.

Fluvial – Of, relating to, or inhabiting a river or stream.

Footwall – A block of rock that lies on the underside of an inclined fault or of a mineral deposit.

Forbs – Broadleaf ground vegetation with little or no woody material (Forest Service 2003).

Forest Road or Trail – A road or trail wholly or partly within or adjacent to and serving the NFS that the Forest Service determines is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources.

Formation – A body of rock strata (layers) that consists of a certain lithology (physical characteristic of rock) or combination of lithologies.

Fracture – A subplanar discontinuity in a rock or soil formed by mechanical stresses. A fracture is visible to the naked eye and is open (i.e., not filled with minerals).

Freeboard – A factor of safety added in channel and dam design, usually expressed in additional feet of water carrying capacity or storage above a design storm event.

Fry – Young or newly hatched fish.
Fugitive Dust – Dust particles suspended randomly in the air, usually from road travel, excavation, and rock loading operations.

Geochemistry – The study of the distribution and amounts of chemical elements in minerals, ores, rocks, soils, water and the atmosphere and the study of the circulation and transformations of these elements in nature.

Geographic Information System (GIS) – A computer system that stores and uses spatial (mappable) data (Forest Service 2003).

Geomorphic – Characteristics, configuration and evolution of rocks and landforms.

Geotechnical – Concerned with the engineering design aspects of slope stability, settlement, Earth pressures, bearing capacity, seepage control and erosion.

Grade – A measure of the potential value of ore, based on the degree of purity of the minerals and the relative percentages of the minerals contained in the rock.

Groundwater – Water beneath the land surface in the zone of saturation below the water table.

Grout – Bentonite- or cement-based material used to create a water-tight seal.

Growth Media – Material capable of establishing and sustaining an effective and permanent vegetation cover.

Growth Media Additive – Composted organic material that can be added to growth media to increase the volume of the growth media such as cleared and chipped vegetation, grubbed organics, and food wastes.

Grubbed Organics – Vegetative roots and other organic material that lies near and just below the ground surface and is removed as part of preparation of a site for construction.

Habitat – A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals (Forest Service 2003).

Haul Road – A road used by large (typically off-road) trucks to relocate material (development rock or ore) for deposition or processing.

Heap leach – An industrial mining process to extract precious metals from ore. Typically, crushed ore is heaped where it can be irrigated with a weak acid and/or cyanide leach solution to dissolve the valuable metals into a solution that is collected and further refined.

Heap leach pad – The impermeable plastic, asphalt, and/or clay-lined pad upon which mined ore is deposited to be leached.
Heritage Resource - An object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Heritage resources include prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (Forest Service 2008).

Highwall – The unexcavated face of exposed overburden and/or ore in an open pit mine.

Historic Property - Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria (36 Code of Federal Regulations [CFR] 800.16).

Home range – The area used by an animal for foraging, mating, and rearing offspring.

Horizon (soil) – A layer parallel to the soil surface, whose physical characteristics differ from the layers above and beneath.

Hydraulic – Dealing with the mechanical properties of liquids.

Hydro-cyclone – A device to classify, separate or sort particles in a liquid suspension based on the ratio of their centripetal force to fluid resistance.

Hydrologic – Refers to the properties, distribution, and effects of water. “Hydrology” is the study of water, its occurrence, circulation, distribution, properties, and reactions with the environment.

Highway-Legal Vehicle – Any motor vehicle that is licensed or certified under state law for general operation on all public roads in the state. Operators of highway-legal vehicles are subject to state traffic law, including requirements for operator licensing.

Idaho Roadless Area – Areas designated pursuant to 36 CFR Part 294 and identified in a set of maps maintained at the national headquarters office of the Forest Service.

Infiltration – The movement of water or other fluid into the soil (or other medium) through pores or other openings.

Infrastructure – The facilities, utilities, and transportation systems needed to meet public and administrative needs.

Interim closure – Temporary or provisional cessation of the operation of a mining or processing activity, in part or in whole, as a result of a planned or unplanned activity. While operational activities temporarily cease under interim closure, facility maintenance, environmental protection measures, and site monitoring requirements typically remain active.

Interim reclamation – Temporary stabilization of land surfaces during operations.
Intermittent stream – A stream or portion of a stream that flows only in direct response to precipitation or seasonal runoff, and that receives little or no water from springs or other permanent sources. Unlike ephemeral streams, an intermittent has a well-defined channel and banks, and it may seasonally be below the water table (Forest Service 2003).

Johnson Creek Route – The mine access route during the initial construction period for the 2021 MMP and the mine access route throughout construction, operations and reclamation under the Johnson Creek Route Alternative. From Warm Lake the Johnson Creek Route would be via Johnson Creek Road (County Road 10-413) to the village of Yellow Pine, and from Yellow Pine to the mine site via the East Fork Road (NFS Road 50412, also known as Stibnite Road) to Thunder Mountain Road.

Land and Resource Management Plan (LRMP) – LRMPs guide natural resource management activities on lands administered by the Payette and Boise National Forests. They describe management goals and objectives, resource protection methods, desired resource conditions, and the availability and suitability of lands for resource management. They provide management direction to ensure sustainable ecosystems and resilient watersheds capable of providing a sustainable flow of beneficial goods and services to the public.

Leach – To remove (nutritive, valuable, or harmful elements) from soil, rock, or ore by percolation.

Leachate – The solution obtained by leaching.

Leaching – The process of applying a chemical agent to bond preferentially with and dissolve materials such as gold and silver.

Lift – A layer of development rock placed in approximately the same time with one outslope. Each lift in the development rock storage facility is followed by a setback from the outslope to create a bench and then construction of the next lift.

Liner – Low permeability material (clay or synthetic) used to create a barrier, such as between tailings or water and the underlying ground surface.

Loam – Soil composed of a relatively even distribution of sand, silt and clay. Loamy soils are typically well-drained and ideal for supporting vegetation.

Local Road – An NFS road that connects a terminal facility with collector roads, arterial roads, or public highways and that usually serves a single purpose involving intermittent use.

Macro-invertebrate – An animal without vertebrae (i.e., backbone) that is large enough to be seen without use of a microscope.

Magnitude – A number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph. Several scales have been defined, but all magnitude scales should yield approximately the same value for any given earthquake.
Maintenance Level – A Forest Service defined level of service provided by, and maintenance required for, a specific road.

Make-up Water – The amount of water which is added to compensate for water losses in a process. In the case of ore processing, water losses can occur through evaporation or through entrainment with the ore particles in the tailings discharge.

Management area – A land area with similar management goals and a common prescription, as described in the Forest Plan (Forest Service 2003).

Management indicator species (MIS) – Representative species whose habitat conditions or population changes are used to assess the impacts of management activities on similar species in a particular area. MIS are generally presumed to be sensitive to habitat changes (Forest Service 2003).

Management Prescription Category (MPC) – Management prescriptions are defined as, “Management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives” (36 CFR 219.3). MPCs are broad categories of management prescriptions that indicate the general management emphasis prescribed for a given area. They are based on Forest Service definitions developed at the national level, and represent management emphasis themes, ranging from Wilderness (1.0) to Concentrated Development (8.0). The national MPCs have been customized during Forest Plan revision to better fit the needs and issues of the Southwest Idaho Ecogroup Forests (Forest Service 2003).

Matrix – In landscape ecology, a matrix is usually the most extensive and connected element present in a landscape. Patches and corridors are often imbedded in the matrix. The matrix may play a dominant role in the functioning of the landscape without being the most extensive landscape element. Determining the matrix in a landscape depends either on connectivity, dominance, or function. Each landscape should be evaluated individually (Forest Service 2003).

Maximum credible earthquake (MCE) – The largest earthquake that reasonably appears capable of occurring under the conditions of the presently known geological environment (IDAPA 36.03.06). The MCE represents the most severe ground shaking that could be expected at the site (return period from 2,500 years up to that of the MCE) for which structures must be designed to resist collapse and uncontrolled release.

Maximum design earthquake – An earthquake that would produce the maximum level of ground motion (shaking) for which a structure (e.g., TSF dam) is to be designed or evaluated.

Merchantable – Logs exceeding a minimum size and a minimum usable value that are suitable for sale (Stokes et al. 1989).

Metabolic – A complex of physical and chemical events of photosynthesis, respiration, and the synthesis and degradation of organic compounds (in plants).

Meteoric Water – Water derived from precipitation (snow and rain).
Mine – An opening or excavation in the ground for the purpose of extracting minerals.

Mine life – The period in which the ore reserves will be extracted.

Mineralization – The process by which a mineral or minerals are introduced to rock, resulting in a valuable or potentially valuable deposit; a zone of ore.

Mining Act of 1872 – A United States federal law that authorizes and governs prospecting and mining for economic minerals, such as gold, platinum, and silver, on federal public lands.

Mitigate – To avoid, minimize, reduce, eliminate, rectify, or compensate for impacts or degradation that might otherwise result from management actions (Forest Service 2003).

Mitigation measure – Modifications of actions that: 1) avoid impacts by not taking a certain action or parts of an action in a given area of concern; 2) minimize impacts by limiting the degree or magnitude of the actions and its implementation; 3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; 4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or 5) compensate for impacts by replacing or providing substitute resources or environments (Forest Service 2003).

Mosaic – A varying pattern of vegetation types.

Motorized Mixed Use – Designation of an NFS road for use by both highway-legal and non-highway-legal motor vehicles.

Multi-storied – Tree stands with trees of multiple heights.

National Forest System (NFS) Road/Trail – A forest road/trail other than a road/trail which has been authorized a legally documented right-of-way held by a state, county, or local public road authority.

Neutralization – A chemical reaction in which an acid and a base react quantitatively with each other. In a reaction in water neutralization results in there being no excess of hydrogen or hydroxide ions present in solution. The pH of the neutralized solution depends on the acid strength of the reactants.

No Action Alternative – The most likely condition expected to exist if current management practices continue unchanged. The analysis of this alternative is required for federal actions under NEPA (Forest Service 2003).

Nocturnal – Relating to or occurring at night.

Non-Contact Water – Water that has not come in contact with mining disturbance and/or mining materials.

Non-forested – Having grass, shrub, forb or non-vegetation cover.

Non-serotinous – Not exhibiting the characteristics of being serotinous (see definition of serotinous).
Noxious weed – A state-designated plant species that causes negative ecological and economic impacts to both agricultural and other lands within the state (Forest Service 2003).

Off-Highway Vehicle (OHV) – Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

Open-pit mining – A type of surface mining that involves excavation of the ore and development rock by above ground techniques. The result of such an operation is known as an “open pit.”

Ordinary high water mark (OHWM) – The mark on all watercourses that will be found by examining the beds and banks and ascertaining where the presence and action of waters are so common and continuous in ordinary years as to mark upon the soil a character distinct from that of the abutting upland (Boise Forest Plan).

Ore – A deposit of rock from which valuable material or minerals can be economically mined.

Ore Processing Facility – A facility where the valuable constituent (e.g., gold, silver, antimony) is separated from the undesirable or non-economic constituent of the ore material.

Outfall – The outlet of a body of water. The location of the mouth of the stream or the outlet of the lake; or the vent or end of a drainpipe, tube, ditch, canal that carries water or tailings slurry.

Outslope – The angle of the outside slope face of a constructed facility such as a development rock storage facility (DRSF) or tailings storage facility (TSF).

Overburden – Materials overlying an ore or mineral body that are displaced during mining without being processed. Also known as “waste” or “spoil.” It is typically not contaminated with toxic components.

Over-Snow Vehicle (OSV) – A motor vehicle that is designed for use over snow and that runs on a track or tracks and/or ski or skis, while in use over snow.

Palustrine – Relating to a system of inland, non-tidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface).

Parameter – A variable as a part of a set of comparable variables or limits, boundaries or guidelines.

Partial retention (PR) – A category of Visual Quality Objective (VQO) where human activities may be evident to the casual Forest visitor but must remain subordinate to the characteristic landscape (Forest Service 2003).

Patented Claim – Land granted by the U.S. government to a private party based on mineral value and meeting other requirements under the federal mining laws. It is private property whereby the owner has title to the surface and mineral resources.
Perennial stream – A stream that typically maintains year-round surface flow, except possibly during extreme periods of drought. A perennial stream receives its water from springs or other permanent sources, and the water table usually stands at a higher level than the floor of the stream (Forest Service 2003).

Permeability – The ease with which a porous medium can transmit water or other fluids.

pH – A measure of the acidity or basicity of an aqueous solution.

Piezometer – A device placed in a borehole to measure the underground pressure of groundwater – effectively measuring the level to which the groundwater would rise without a confining (e.g., clay, silt) layer.

Plasticity (of soil) – The property by which it undergoes deformation without cracking or fracturing. In general, soils with low plasticity are more geotechnically stable than soils with high plasticity.

Point source – A single, identifiable source of measurable discharge or emissions, usually referring to water or air.

Porous media – A material containing void spaces, some interconnected, in a matrix of solid material.

Portal – Entrance to an underground mine.

Practicable (or feasible) – Capable of being reasonably done under practical conditions, including economic and technical factors.

Presumptive – Based on presumption or probability; affording reasonable ground for belief in the absence of further information.

Private Road – A road under private ownership authorized by an easement granted to a private party or a road that provides access pursuant to a reserved or outstanding right.

Probable Maximum Precipitation – The theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year; in practice, this is derived over flat terrain by storm transposition and moisture adjustment to observed storm patterns.

Probable Mineral Reserve – The economically mineable part of the measured mineral resource.

Public Road – A road under the jurisdiction of and maintained by a public road authority and open to public travel.

Raise – Underground opening driven upward from one level to a higher level or to the surface; a raise may be either vertical or inclined. Also, a stage of embankment construction.

Recessive weathering – The surrounding rock (in this case the rock on either side of a fault) is more resistant to weathering than the fault gouge material.
Recharge – The process by which water enters the groundwater system (zone of saturation below the water table).

Reclamation (mine facilities) – The decommission and removal of mining structures and equipment used during operations followed by the stabilization of the facilities and rehabilitation of the ground surface to its intended post-mining land use, usually in conformity with a predetermined Land Management Plan or government approved plan or permit.

Reclamation cost estimate – An estimate of the direct and indirect costs to the government to complete reclamation of a mineral operation.

Reclamation bond – Bonds guarantee repair of surface resource disturbance, equipment removal, waste disposal, and similar actions (FSM 6500 – Finance and Accounting, Chapter 6560 – Bonding Administration, 6561.4).

Recommended wilderness areas – Areas (generally identified during the preparation or revision of Forest Plans) that the Forest Service recommends to Congress as candidates for designation as Wilderness. Only Congress can designate wilderness.

Redd – A spawning nest built by fish (such as salmon and steelhead) in the gravel of streams or the shoreline of lakes for the deposition and fertilization of eggs.

Re-establishment – The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions (CWA Section 404).

Regolith – A general term used in reference to unconsolidated rock, alluvium or soil material on top of the bedrock. Regolith may be formed in place or transported in from adjacent lands.

Rehabilitation – The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function but does not result in a gain in aquatic resource area (CWA Section 404).

Remote sensing – The scanning of the Earth by satellite or high-flying aircraft in order to obtain information about the Earth.

Restoration – Management actions or decisions taken to restore the desired conditions of habitats, communities, ecosystems, resources, or watersheds. For soil, water, riparian, or aquatic resources, restoration may include any one or a combination of active, passive, or conservation management strategies or approaches (Forest Service 2003).

Return period (or recurrence interval) – The estimated average time between earthquake events.

Right-of-way – A strip of land or corridor over which a powerline, access road, maintenance road, or other road can pass.
Riparian areas or zones – Terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated with high water tables, and soils that exhibit some wetness characteristics (Forest Service 2003).

Road decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7705) (Forest Service 2003).

Roof pendant – A mass of original rock that remains after being intruded by igneous rock and projects downward into the intrusive rock (in this case, the batholith).

Runoff – Precipitation or snowmelt that is not retained on the site where it falls and is not absorbed by the soil; the natural drainage away from an area.

SAG mill – SAG is an acronym for semi-autogenous grinding (defined below). SAG mills are essentially autogenous mills that uses grinding balls like a ball mill.

Salmonid – Any of the family (Salmonidae), which are elongate bony fishes that have the last three vertebrae upturned, including salmon, trout, chars, freshwater whitefishes and graylings.

Sediment – Earth material transported, suspended and deposited by air, water or ice; also, the same material once it has been deposited.

Sedimentation – The action or process of forming and depositing sediments. Stream sedimentation occurs when water velocity cannot transport the bed load and suspended matter is deposited by gravity along the streambed (Forest Service 2003).

Seep – A spot where water trickles out of the ground to form a pool.

Semi-autogenous Grinding – A size reduction process for ore which uses a large rotating drum to throw ore and steel balls in a cascading fashion to reduce the ore size by impact and compressive grinding with other ore rock, the steel balls and the walls of the drum.

Sensitive species – A Forest Service or BLM designation, sensitive plant and animal species are selected by the Regional Forester or the BLM State Director because population viability may be a concern, as evidenced by a current or predicted downward trend in population numbers or density, or a current or predicted downward trend in habitat capability that would reduce a species’ existing distribution. Sensitive species are not addressed in or covered by the ESA (Forest Service 2003).

Seral-stage – A Sere is a sequence of plant communities that successively follow one another in the same habitation from the pioneer stage to a mesic climax, and seral-stage refers to the community stage a stand occupies at a given time within a sere (Burns et al. 1990).

Serotinous – Remaining closed on the tree with seed dissemination delayed or occurring gradually. In the case of lodgepole pines in the western portions of the Forests, fire is required to open cones for seed dispersal.
Silt fence – A temporary sediment control device consisting of a piece of synthetic filter fabric stretched between a series of wooden or metal fence stakes.

Sinuosity – State of having curving or bending shape, as in a stream course.

Silviculture – The care and tending of stands of trees to meet specific objectives (Forest Service 2003).

Slump – as defined for the EIS: Geohazard assessment reports (STRATA 2013, 2014a, 2016) use the term “slough” and “slump” interchangeably to refer to “small landslides” of less than 0.1 acre. For purposes of consistency, this EIS uses the term “slump” in the text. However, figures originating from the referenced geohazard assessment report may still retain the use of “slough.”

Slurry – A highly fluid mixture of water and fine material; either naturally occurring such as a muddy lake bottom deposit, or human made like the ground rock (tailings) and water remaining after mineral extraction.

Smelter – An industrial facility that uses heat and a chemical reducing agent to decompose ore, driving off other elements as gasses or slag and leaving the metal behind.

Smelting – A process to extract metals from ore involving heating and melting.

Soil nail walls – Retaining wall constructed in lifts by drilling rows of nails and applying a shotcrete face. The purpose is to construct a retaining wall (temporary or permanent) where sloping per OSHA standards is not possible.

Soundscape – Refers to both the natural acoustic environment, including animal vocalizations and the sounds of weather and other natural elements; and environmental sounds created by human activity, including conversation, work, and sounds of mechanical origin resulting from use of industrial technology.

Standard – As Forest Plan management, a binding limitation placed on management actions. It must be within the authority and ability of the Forest Service to enforce. A project or action that varies from a relevant standard may not be authorized unless the Forest Plan is amended to modify, remove, or waive application of the standard (Forest Service 2003).

Steelhead – A rainbow trout that migrates to the sea before returning to freshwater to spawn.

Stibnite - A sulfide mineral with the formula Sb2S3. A lead-gray mineral with a brilliant metallic luster. It is the principal ore of antimony. Also name of a historic mining town in central Idaho.

Stratum – One of a series of layers, levels, or gradations in an ordered system, such as a sequence of sedimentary rocks.

Stockpile – Material piled for future use.
Stope – An area of rock excavated in an underground mine, usually by blasting the rock and letting it fall into previously mined open areas below the stope.

Stormwater – The runoff that reaches human-made channel structures or natural stream channels immediately after rainfall or snowmelt.

Sulfide – A mineral compound characterized by the bonding of the element of sulfur (S), typically with a metal or metals.

Sub-alpine environment – Of, relating to, or inhabiting high upland slopes and especially the zone just below the timberline. It is the biotic zone (caused by living organisms) immediately below tree line.

Sump – A small, excavated pit for water supply and storage.

Surface water channels – Constructed pathways that change the flow of water from its natural course; mostly by means of a ditch.

Supernatant – The liquid that remains in a surface pool after the solid tailings settle in the tailings storage facility.

Supernatant Pool – In a tailings impoundment, the water that gathers above the settled tailings material.

Synthetic liner – A protective layer comprised of man-made materials installed along the bottom, sides and/or of a waste disposal area, leach pad, or pond to reduce fluid migration into or out of that disposal area, pad or pond, or to facilitate the collection of mineral-rich leachate.

Tailings – The non-economic, ground rock material that remains after the valuable minerals have been removed from the ore by milling and subsequent mineral recovery circuits.

Tailings Storage Facility (TSF) – The TSF embankment and all associated infrastructure needed to safely, efficiently and successfully manage and store tailings.

Temporary road – Roads authorized by contract, permit, lease, other written authorization, or emergency operation, that are not intended to be part of the forest transportation system, and that are not necessary for long-term resource management (Forest Service 2003).

Terrestrial – Organisms occurring on land.

Threatened species – Designated by the USFWS or NMFS; a plant or animal species given federal protection because it is likely to become endangered throughout all or a specific portion of its range within the foreseeable future (Forest Service 2003).

Topographic quadrangle map – A type of map characterized by large-scale detail and quantitative representation of relief, typical scale is 1:24,000, where 1-inch equals 2,000 actual feet.
Topsoil – The upper, outermost layer of soil, usually the top 2 inches (5.1 cm) to 8 inches (20 cm). It has the highest concentration of organic matter and microorganisms and is where most of the Earth's biological soil activity occurs.

Total maximum daily load (TMDL) – TMDL is the sum of waste load allocations for point sources, non-point sources, natural background, and a margin of safety. A TMDL specifies the amount of a pollutant that needs to be reduced to meet water quality standards set by the state. TMDL is used in a process to attain water quality standards that (1) identifies water quality problems and contributing pollutant sources, (2) allocates pollution control responsibilities among sources in the watershed, and (3) provides a basis for taking actions needed to restore a water body (Forest Service 2003).

Total organic carbon – The amount of carbon bound in an organic compound, which may refer to the amount of organic carbon in a water or soil sample.

Traditional Cultural Property - A “traditional cultural property” is a property, a place, that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices and beliefs that are (1) rooted in the history of a community, and (2) are important to maintaining the continuity of that community’s traditional beliefs and practices.

Tributary – A river or stream flowing into a larger river or lake.

Turbidity – Thick or opaque with, or as if with, stirred up sediment.

Underground Mining – A mining method consisting of an adit decline or shaft access where ore is mined using various methods and hauled to the surface.

Understory – Vegetation, usually shrubs, forbs, and grasses growing beneath taller trees.

Unconfined aquifer – The upper surface of the aquifer is the water table. Unconfined aquifers are directly overlain by an unsaturated zone or a surface waterbody.

Unconsolidated – Loosely arranged.

Underflow – The flow of groundwater in alluvial materials beneath and immediately adjacent to a stream and flowing in the same general direction as the stream.

Viscosity – The property of resistance to flow in a fluid or semi-fluid.

Waste Rock – The rock that must be removed and disposed of to gain access to and excavate ore. Also referred to as “development rock.”

Waters of the U.S. – A jurisdictional term from the Clean Water Act (CWA) and implementing regulations referring to wetlands, streams, and other waterbodies within the scope of fill permitting requirements under the CWA.
Watershed – Region or area drained by surface and groundwater flow in rivers, streams, or other surface channels. A smaller watershed can be wholly contained within a larger one, as watersheds are hierarchical in structure.

Water table – A surface at or near the top of the zone of saturation where the fluid pressure is equal to atmospheric pressure. In the field, the water table is defined by the level of water in wells that penetrate the saturated zone.

Weak acid dissociable cyanide – A method of conservatively estimating cyanide toxicity through measurement of both free cyanide and weakly bonded cyanide species that are released when subjected to a weak acid solution.

Wetlands – Land areas that are wet at least for part of the year, are poorly drained, and are characterized by hydrophytic vegetation, hydric soils, and wetland hydrology. Examples of wetlands include swamps, marshes, and bogs (Forest Service 2003).

Wilderness areas – Areas that are without developed and maintained roads, and that are substantially natural, and that Congress has designated as part of the National Wilderness Preservation System (Forest Service 2003).

Wildland/urban interface – The line, area, or zone where structures and other human developments meet or intermingle with wildland or vegetative fuel. Interface is further delineated into the following types:

(a) wildland/urban interface—developed areas with residential structures where many structures border wildland on a broad front.

(b) wildland/rural interface—developed areas with private residential structures where developments are few in number scattered over a large area surrounded by wildland (Forest Service 2003).

Windrow – A long line of material such as topsoil or vegetation.

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Payette National Forest and Boise National Forest Land and Resource Management Plans Consistency Review and Amendments
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1.0 FOREST PLAN CONSISTENCY

The Payette National Forest (PNF) and the Boise National Forest (BNF) are managed under separate Land and Resource Management Plans: The Payette National Forest Land and Resource Management Plan (Payette Forest Plan) (U.S. Forest Service [Forest Service] 2003), and the Boise National Forest Land and Resource Management Plan (Boise Forest Plan) (Forest Service 2010). Both Forest Plans were revised in 2003, and the Boise Forest Plan was amended in 2010, under the 1982 planning rule.

The National Forest Management Act (NFMA) requires that proposed projects on National Forest System (NFS) lands, including third-party proposals subject to permits, be consistent with Forest Plan direction. The PNF and BNF took into consideration consistency of the Proposed Action with Forest Plan desired conditions, goals, objectives, standards, and guidelines. These plan components are identically defined in the Payette and Boise Forest Plans (Ch. III, pp. III-2 to III-3).

As stated in Chapter 1 of the EIS, locatable minerals operations are governed by the Forest Service Locatable Minerals regulations at 36 Code of Federal Regulations (CFR) 228 Subpart A, and the United States Mining Laws (30 U.S.C. 2154). The Forest Service received the original SGP Plan in 2016, (Midas Gold Idaho, Inc. [Midas Gold] 2016) for review and approval in accordance with 36 CFR 228 Subpart A. A revised Plan, also known as ModPRO¹, was submitted to the Forest Service in 2019 (Brown and Caldwell 2019). A further modified Plan, also known as ModPRO2, was initially submitted in December 2020 with a revised submittal in October of 2021 (Perpetua 2021). Midas Gold changed their name to Perpetua Resources Ltd (Perpetua) in February 2021³.

The Plan submitted by Perpetua aligns with the forest-wide goals and objectives for the PNF and BNF as they relate to Minerals and Geology resources (Payette Forest Plan, pp. III-48 to III-49; Boise Forest Plan, pp. III-50 to III-51). It is recognized that not all proposals would move towards or achieve desired conditions, goals, or objectives and there may be tradeoffs between moving towards or achieving these for one resource or another.

Most areas of the PNF and BNF are open to mineral activities, including the SGP area. The desired condition for mineral projects is that operating plans include appropriate mitigation measures and contain bonding requirements commensurate with the costs of anticipated site reclamation. Where practicable, sites are returned to a condition consistent with management emphasis and objectives. (Payette Forest Plan, p. III-48; Boise Forest Plan, p. III-50)

¹ Associated project documents may reference the Revised Plan as the ModPRO.
² Associated project documents may reference the Modified Plan as the ModPRO2.
³ Documents provided by Perpetua prior to the February 2021 name change will still be cited and referenced as Midas Gold.
As Forest Plan management direction, a standard is a binding limitation placed on management actions and must be within the authority and ability of the Forest Service to enforce. The Forest Plans clarify that a project or action that varies from the relevant standard may not be authorized unless the Forest Plan is amended to modify, remove, or waive application of the standard. When a project is not consistent with Forest Plan standards applicable to the location of a project and/or the types of activities proposed, the Forest Service has the following options:

1. modify the proposed project to make it consistent with the Forest Plan; 2. reject the proposal; 3. amend the Forest Plan so that the project would be consistent with the Forest Plan as amended; or 4. amend the Forest Plan contemporaneously with the approval of the project so the project would be consistent with the Forest Plan as amended (i.e., project-specific Forest Plan amendment). The fourth option is limited to apply only to the project (36 CFR 219.15(c)).

The Payette and Boise Forest Plans define guidelines “As Forest Plan management direction, a guideline is a preferred or advisable course of action generally expected to be carried out.

Deviation from compliance does not require a Forest Plan amendment (as with a standard), but rationale for deviation must be documented in the project decision document” (Payette Forest Plan, p. GL-17 and Boise Forest Plan, p. IV-21).

Additional information on the consideration of Forest Plan consistency, including guidelines, is contained in the Project Record. The following subsection describes those aspects of the Forest Plans where the proposed activities under the SGP were found to be inconsistent with relevant standards, and for which project-specific Forest Plan amendments are proposed.

2.0 LAND AND RESOURCE MANAGEMENT PLAN AMENDMENTS

The purpose of the amendments is to ensure consistency between the SGP and the Forest Plans. The 2012 Planning Rule (36 CFR 219) requires the decision document to explain how the responsible official for the amendment determined the scope and scale of the Forest Plan amendment and which specific requirements of the 2012 Planning Rule within Sections 219.8 through 219.11 apply to the amendment and how they were applied. Because the Forest Plan amendments are project-specific, the scope of the amendments would only be for the SGP. The scale of the amendments is the area directly, indirectly, and cumulatively affected by the SGP.

The determination of purpose is based on the purpose of the Forest Plan component being amended. For a project-specific amendment, purpose also includes the purpose of the SGP.
2.1 General Management Actions Project Specific Amendment

Forest: Payette and Boise National Forest

Alternatives: 2021 MMP and Johnson Creek Route Alternative

2.1.1 Plan Component

PNF: Standard 1301 (MA 13, MPC 3.1); Standard 1306 (MA 13, MPC 3.2)

BNF: Standard 2010 (MA 20, MPC 3.2); Standard 2113 (MA 21, MPC 3.2); Standard 1919 (MA 19, MPC 3.2); Standard 2005 (MA 20, MPC 3.1)

Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary time period (up to 3 years), and must be designed to avoid resource degradation in the short term (3-15 years) and long term (greater than 15 years).

2.1.2 Proposed Amendment

The project specific amendments waive the following plan components in the portions of MA 13 (PNF) and MA 19, 20, and 21 (BNF) that are affected by the proposed SGP through the duration of project implementation.

PNF: Standard 1301 (MA 13, MPC 3.1); Standard 1306 (MA 13, MPC 3.2)

BNF: Standard 2010 (MA 20, MPC 3.2); Standard 2113 (MA 21, MPC 3.2); Standard 1919 (MA 19, MPC 3.2); Standard 2005 (MA 20, MPC 3.1)

The waiving of the above standards meets the following purpose and needs for the SGP:

- The Forest Service’s purpose is to consider approval of the Plan, to mine and process gold, silver, and antimony from deposits at the mine site in central Idaho for commercial sale. The purpose of the SGP is consistent with Congress’ declaration in the Mining and Mineral Policy Act of 1970 (Public Law 91-631 as amended through Public Law 106-193)

- The Forest Service’s need for action is established by the agency’s responsibilities under the Locatable Minerals regulations at 36 CFR 228 Subpart A, which were promulgated under authority granted by the Mining Law of 1872 (Mining Law) (30 USC 22 et seq.) and the Organic Administration Act of 1897 (16 USC 478, 482, and 551). These regulations require that all locatable mineral prospecting, exploration, development, mining and processing operations, and associated means of access, shall be conducted in a manner that minimizes adverse environmental effects on NFS surface resources.

The SGP has a proposed timeline of construction being approximately 3 years, operations approximately 12 years, and closure and reclamation approximately 5 years. Due to the nature of proposed SGP activities, impacts to aquatic, terrestrial, and watershed resource conditions would be expected to occur for the length of the proposed SGP. Impacts to aquatic resources are analyzed in Sections 4.8.2 (Surface and Groundwater Quantity), 4.9.2 (Surface and Groundwater Quality), and 4.12.2 (Fish Resources and
Fish Habitat); terrestrial resources in Sections 4.10.2 (Vegetation) and 4.13.2 (Wildlife and Wildlife Habitat); and watershed resource conditions are analyzed in Sections 4.5.2 (Soils and Reclamation Cover Materials) and 4.11.2 (Wetlands and Riparian Resources). These sections analyze impacts to the specific resources during construction, operations, and closure and reclamation. During construction and operations, design features and mitigations are included to reduce impacts to various resources (Section 2.4.9). Reclamation actions are described in the SGP Reclamation and Closure Plan (Tetra Tech 2021) and impacts to the various resources are described in the sections listed above.

The following table provides documentation for the review of substantive requirements of planning regulations for the SGP project-specific amendment to waive the timeframe period within the proposed SGP area. This amendment is proposed to take effect for the life of the SGP and would expire when project activities have been completed.
### Table 1: General Management Actions Project Specific Plan Amendment Review

<table>
<thead>
<tr>
<th>Planning Regulation Section</th>
<th>Part</th>
<th>Subpart</th>
<th>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>219.8 Sustainability</td>
<td>(a) Ecological Sustainability</td>
<td>(1) Ecosystem Integrity</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. Some of the impact to various resources would extend for the length of the activities (including reclamation) associated with the proposed SGP (e.g., impacts to individual wildlife (Section 4.13.2), while other impacts could extend further into the future (e.g., total soil resource commitment (Sections 4.5.2.2 and 4.5.2.3). Post-closure, surface water and groundwater quantity would return to similar baseline flow patterns (Section 4.8.2) and water quality (with treatment) would meet standards for surface waters and groundwater, except for areas under the Tailings Storage Facility (TSF)/TSF Buttress and in the vicinity of backfilled open pits where some metal concentrations are predicted to exceed baseline conditions (Section 4.9.2.2). Habitat for listed fish species in upper Meadow Creek would be blocked due to the TSF/TSF Buttress while other habitat would be made available by the removal of fish-passage barriers (Section 4.12.2). Impacts to wetland and riparian areas are expected to be offset by reclamation activities and compensatory mitigation (Section 4.11.3). The mitigations and reclamation actions developed for each resource are created to maintain and restore ecosystem integrity.</td>
</tr>
<tr>
<td>219.8 Sustainability</td>
<td>(a) Ecological Sustainability</td>
<td>(2) Air, Soil, and Water</td>
<td>The plan amendments waive the time frame for the impacts but retain the plan components to maintain or restore these resources (Sections 4.3.2, 4.5.2, 4.8.2, and 4.9.2).</td>
</tr>
<tr>
<td>3) Riparian Areas</td>
<td>(b) Social and Economical Sustainability</td>
<td>(1) Social, cultural, and economic conditions</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>3) Riparian Areas</td>
<td>(b) Social and Economical Sustainability</td>
<td>(2) Air, Soil, and Water</td>
<td>The plan amendments waive the time frame for the impacts but retain the plan components to maintain or restore these resources. Impacts to riparian areas are expected to be offset by reclamation activities and compensatory mitigation (Section 4.11.3).</td>
</tr>
<tr>
<td>3) Riparian Areas</td>
<td>(b) Social and Economical Sustainability</td>
<td>(3) Water Quality</td>
<td>The plan amendments waive the time frame for the impacts but retain the plan components requiring implementation of water quality BMPs (Section 4.9.2).</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
<td>Part</td>
<td>Subpart</td>
<td>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</td>
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<tr>
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<tr>
<td>(2) Sustainable recreation, including recreation settings, opportunities, and access; and scenic character.</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
<td></td>
</tr>
<tr>
<td>(3) Multiple uses that contribute to local, regional, and national economies in a sustainable manner</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td>(4) Ecosystem services</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
<td></td>
</tr>
<tr>
<td>(5) Cultural and historic resources and uses</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
<td></td>
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<tr>
<td>(6) Opportunities to connect people with nature</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
<td></td>
</tr>
<tr>
<td>219.9 Diversity of plant and animal communities</td>
<td>(a) Ecosystem plan components</td>
<td>(1) Ecosystem integrity</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. Some of the impact to various resources would extend for the length of the activities (including reclamation) associated with the proposed SGP (e.g., impacts to individual wildlife [Section 4.13.2]) while other impacts could extend further into the future (e.g., total soil resource commitment [Sections 4.5.2.2 and 4.5.2.3]). Post-closure, surface water and groundwater quantity would return to similar baseline flow patterns post-reclamation (Section 4.8.2.2), and water quality (with treatment) would meet standards for surface waters and groundwater, except for areas under the TSF/TSF Buttress and in the vicinity of backfilled open pits where some metal concentrations are predicted to exceed baseline conditions (Section 4.9.2.2). Habitat for listed fish species in upper Meadow Creek would be blocked due to the TSF/TSF Buttress under the 2021 MMP and Johnson Creek Route Alternative, while other habitat would made available by the removal of fish-passage barriers (Section 4.12.2). Impacts to wetlands and riparian areas are expected to be offset by reclamation activities and compensatory mitigation (Section 4.11.3). The mitigations and reclamation actions developed for each resource are created to maintain and restore ecosystem integrity.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<td>(2) Ecosystem diversity</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. The plan amendments waive the time frame for the impacts but retain the plan components requiring maintenance or restoration of key characteristics associated with terrestrial and aquatic resources (<em>Sections 4.9.2 – Surface Water and Groundwater Quality, 4.12.2 – Fish Resources and Fish Habitat, and 4.13.2 – Wildlife and Wildlife Habitat</em>); rare aquatic and terrestrial plant and animal communities (<em>Vegetation Section 4.10.2; Fish Section 4.12.2; and Wildlife Section 4.13.2</em>); and the diversity of native tree species (<em>Section 4.10.2</em>).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) and (2) components to provide the ecological conditions necessary to contribute to the recovery of federally listed or proposed species (<em>and viable species of conservation concern</em>) beyond those required at part (a) of this section</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. The mitigations and reclamation actions are developed to minimize impacts to fish and wildlife and maintain and/or restore terrestrial and aquatic habitat. There would be impacts to individual Endangered Species Act (ESA)-listed wildlife and fish species and habitat, but the implementation of the SGP would not result in jeopardy (pending Section 7 consultation) (<em>Fisheries and Aquatic Habitat Sections 4.12.2.2 and 4.12.2.3, and Wildlife Sections 4.13.2.2 and 4.13.2.3</em>). The SGP would not result in a trend towards listing for ESA proposed species (<em>Sections 4.13.2.2 and 4.13.2.3</em>).</td>
</tr>
<tr>
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<td></td>
<td>(c) Species of conservation concern</td>
<td>There are no species known to occur within the proposed SGP area with a substantial concern about the species capability to persist over the long-term in the Forest Plan area (<em>Vegetation Sections 4.10.2.2 and 4.10.2.3; Fish Section 4.12.2; and Wildlife Sections 4.13.2.2 and 4.13.2.3</em>).</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<tr>
<td>219.10</td>
<td>Multiple Use</td>
<td>(a) Integrated resource management for multiple use</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. The effects of the proposed SGP, as well as mitigations and reclamation actions developed to reduce impacts of the proposed SGP, are analyzed in the EIS for the duration of the proposed SGP (approximately 20 years) (Sections 4.3 - Air Quality; 4.5 – Soils and Reclamation Cover Materials; 4.8 - Surface Water and Groundwater Quantity; 4.9 Surface Water and Groundwater Quality; 4.10- Vegetation; 4.11- Wetland and Riparian Resources; 4.12 - Fish Resources and Fish Habitat; 4.13 - Wildlife and Wildlife Habitat; 4.14 – Timber Resources; 4.17 - Heritage Resources; 4.19 - Recreation; 4.20 - Scenic Resources; 4.23 - Special Designations).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, wilderness, and other relevant resources and uses.</td>
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<td></td>
<td></td>
<td>(2) Renewable and nonrenewable energy and mineral resources.</td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP, which is mining of mineral resources.</td>
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<tr>
<td></td>
<td></td>
<td>(3) Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td></td>
<td></td>
<td>(4) Opportunities to coordinate with neighboring landowners to link open spaces and take into account joint management objectives where feasible and appropriate.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<tr>
<td>(5) Habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments).</td>
<td></td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. The mitigations and reclamation actions are developed to minimize impacts to fish and wildlife and maintain and restore terrestrial and aquatic habitat. Impacts over the life of the proposed SGP to traditional resource collection sites (Section 4.24.2), big game species (Section 4.13.2), and fish (Section 4.12.2) are disclosed in the EIS.</td>
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<tr>
<td>(6) Land status and ownership, use, and access patterns relevant to the plan area.</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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</tr>
<tr>
<td>(7) Reasonably foreseeable risks to ecological, social, and economic sustainability.</td>
<td></td>
<td>The proposed plan amendment maintains the intent of the original plan standard, while allowing for the implementation of the proposed SGP. The effects of the proposed SGP, as well as mitigations and reclamation actions developed to reduce impacts of the proposed SGP, are analyzed in the EIS for the duration of the proposed SGP (approximately 20 years) (Sections 4.5 – Soils and Reclamation Cover Materials; 4.8 - Surface Water and Groundwater Quantity; 4.9 Surface Water and Groundwater Quality; 4.10 - Vegetation; 4.11 - Wetland and Riparian Resources; 4.12 - Fish and Fish Habitat; 4.13 - Wildlife and Wildlife Habitat; 4.14 – Timber Resources; 4.18 – Public Health and Safety; 4.19 - Recreation; 4.21- Social and Economic Conditions; and 4.22 - Environmental Justice).</td>
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</tr>
<tr>
<td>(8) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (§ 219.8);</td>
<td></td>
<td>The effects of climate change in relation to the proposed SGP and impacts to other resources (e.g., water quality, fish, wildlife) (Section 4.4.2) and the potential for the expansion of invasive species (Section 4.10.2) are analyzed in the EIS.</td>
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<tr>
<td>Planning Regulation Section</td>
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<tr>
<td>219.11 Timber requirements based on the NFMA</td>
<td>(a) Lands not suited for timber production</td>
<td>(9) Public water supplies and associated water quality.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td></td>
<td>(10) Opportunities to connect people with nature.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td></td>
<td>(b) Timber harvest for purposes of timber production.</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td>(c) Timber harvest for purposes other than timber production.</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td>(d) Limitations on timber harvest</td>
<td>(1) No timber harvest for the purposes of timber production may occur on lands not suited for timber production.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Timber harvest would occur only where soil, slope, or other watershed conditions would not be irreversibly damaged.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
<td>Part</td>
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<td>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</td>
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<td>(4)</td>
<td>Where plan components will allow clearcutting, seed tree cutting, shelterwood cutting, or other cuts designed to regenerate an even-aged stand of timber, the plan must include standards limiting the maximize size for openings that may be cut in one harvest operation, according to geographic areas, forest types, or other suitable classifications. This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>Timber will be harvested from NFS lands only where such harvest would comply with the resource protections set out in sections 6(g)(3)(E) and (F) of the NFMA (16 U.S.C. 1604(g)(3)(E) and (F)). This requirement is not directly related to this project-specific amendment.</td>
</tr>
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<td>(6)</td>
<td>The quantity of timber that may be sold from the national forest is limited to an amount equal to or less than that which can be removed from such forest annually in perpetuity on a sustained yield basis. This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7)</td>
<td>The regeneration harvest of even-aged stands of trees is limited to stands that generally have reached the culmination of mean annual increment of growth. This requirement is not directly related to this project-specific amendment.</td>
</tr>
</tbody>
</table>
2.2 Total Soil Resource Commitment Project Specific Amendment

**Forest**: Payette National Forest

**Alternatives**: 2021 MMP and Johnson Creek Route Alternative

### 2.2.1 Plan Component

**PNF**: Standard SWST03

Management activities that may affect Total Soil Resource Commitment (TSRC) shall meet the following requirements:

- In an activity area where existing conditions of TSRC are below 5 percent of the area, management activities shall leave the area in a condition of 5 percent or less TSRC following completion of the activities.

- In an activity area where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation and restoration so that TSRC levels are moved back toward 5 percent or less following completion of activities.

- To estimate TSRC it is essential that the glossary definitions for “activity area, detrimental soil disturbance and total soil resource commitment” are clearly understood.

### 2.2.2 Proposed Amendment

**PNF**: Standard SWST03

- In the PNF Activity Area for the SGP, which is comprised of the PNF portion of the Headwaters East Fork South Fork Salmon River, Sugar Creek, and No Man’s Creek- East Fork South Fork Salmon River subwatersheds where existing conditions of TSRC are below 5 percent of the area, waive the requirement that management activities shall leave the area in a condition of 5 percent or less TSRC following completion of the activities.

The amendment of this standard meets the following purpose and needs for the SGP:

- The Forest Service’s purpose is to consider approval of the Plan to mine and process gold, silver, and antimony from deposits at the mine site in central Idaho for commercial sale. The purpose of the proposed SGP is consistent with Congress’ declaration in the Mining and Mineral Policy Act of 1970 (Public Law 91-631 as amended through Public Law 106-193).

- The Forest Service’s need for action is established by the agency’s responsibilities under the Locatable Minerals regulations at 36 CFR 228 Subpart A, which were promulgated under authority granted by the Mining Law of 1872 (Mining Law) (30 USC 22 et seq.) and the Organic Administration Act of 1897 (16 USC 478, 482, and 551). These regulations require that all locatable mineral prospecting, exploration, development, mining and processing operations, and
associated means of access, shall be conducted in a manner that minimizes adverse environmental effects on NFS surface resources.

The definition of TSRC in the Payette Forest Plan is “TSRC is the conversion of a productive site to an essentially non-productive site for a period of more than 50 years. Examples include classified or unclassified roads, inadequately restored haul roads, designated skid roads, landing areas, parking lots, mining dumps or excavations, dedicated trails (skid trails also), developed campgrounds, other dedicated facilities, and some stock driveways. Productivity on those areas ranges from 0 to 40 percent of natural (Payette Forest Plan GL-37 and 38).

The majority of construction, mining production, and closure activities would involve excavation, grading, and/or filling of the existing soils that would reduce or eliminate soil productivity.

Currently there is 3% existing TSRC within the PNF Activity Area, which is comprised of the PNF portion of the Headwaters East Fork South Fork Salmon River, Sugar Creek, and No Man’s Creek-East Fork South Fork Salmon River subwatersheds. TSRC under the 2021 MMP and Johnson Creek Alternative within the PNF Activity Area would be 17%.

All the SGP-related disturbance at the mine site would be subject to reclamation activities, with the exception of approximately 278 acres associated with the Hangar Flats high walls, the West End pit lake and high walls, the Midnight pit lake, and Yellow Pine pit high walls (Tetra Tech 2021). The stated goal of the SGP Reclamation and Closure Plan (RCP) (Tetra Tech 2021) is to stabilize and reclaim areas of proposed exploration, mining, and processing activities (which would include areas within the footprint of disturbance that have been impacted by historical mining activities) “to productive conditions that sustain long-term, post-SGP wildlife, fisheries, land, and water resources.” “Productive conditions” are not further defined in the RCP, and there is no direct correlation with moving TSRC towards 5 percent or less in the activity area (i.e., a greater than 40 percent recovery of natural background soil productivity within 50 years of disturbance). The RCP proposes reclamation strategies to return a site to a stable condition that would not require ongoing maintenance or inputs over the long term and would not contribute to erosion or sedimentation that would adversely impact post-mining uses or downstream resources. Many of the reclamation activities proposed relate to achieving soil and slope stability through management and best management practices (BMPs) of surface and groundwater; grading and slope configurations; and establishing persistent vegetation cover.

Planting prescriptions are primarily intended to provide fast-growing native ground cover that would initiate the long-term process of succession towards native forest communities.

Performance monitoring would be tied to slope and soil stability, sediment, and vegetation cover.

Achieving persistent vegetation cover and slope stabilization also would benefit soil amelioration processes. However, the rate of restoration of soil productivity would vary greatly based on the quality of the reclamation cover materials, and site characteristics including slope position, shape and gradient, aspect; elevation, parent materials, seed and propagule sources, and other considerations. As a general rule, the processes responsible for restoration of soil productivity occur over a very long timeframe (centuries) and do not directly correlate to successful reclamation, which is mainly oriented to short-term
objectives. The short target timeframe for achievable reclamation measures (e.g., 5 to 10 years) would not be sufficient to establish trends in soil resources and productivity that would take many centuries and up to millennia to develop within the conditions that pertain to the activity area, especially with respect to the short growing season and harsh winters (Section 4.5.2.2, Total Soil Resource Commitment – Payette National Forest).

A full analysis of the impacts of TSRC is provided in Section 4.5 (Soils and Reclamation Cover Materials) in the EIS. It would not be appropriate to conduct a programmatic amendment because the project level assessment of TSRC identified changed conditions only in the PNF Activity Area where this project-specific amendment is proposed. This project-specific amendment to waive the exceedance of 5 percent TSRC would only apply to the area disclosed in the EIS.

Table 2 provides documentation for the review of substantive requirements of planning regulations for the SGP project-specific amendment to waive the TSRC threshold within the proposed SGP PNF Activity Area.
Table 2  TSRC Project Specific Plan Amendment Review

<table>
<thead>
<tr>
<th>Planning Regulation Section</th>
<th>Part</th>
<th>Subpart</th>
<th>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(1) Ecosystem Integrity</td>
<td>This amendment is consistent with moving toward restoring ecological integrity, post-project activities, by requiring mitigation and restoration of the PNF Activity Area for the SGP. The RCP does not address soil productivity which would not move the PNF Activity Area to a condition of 5 percent or less TSRC. However, the reclamation plan is designed to achieve soil and slope stability through management and BMPs of surface water and groundwater; grading and slope configurations; and establishing persistent vegetation cover (Section 4.5.2.2). Reclamation would occur on all areas of SGP-attributed TSRC except for where pit lakes and pit highwalls occur on NFS lands. The restoration of soil productivity could take an extremely long period of time, but reclamation would benefit soil improvement processes in the area.</td>
</tr>
<tr>
<td>219.8 Sustainability</td>
<td>(a) Ecological Sustainability</td>
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<td></td>
<td>(2) Air, Soil, and Water</td>
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<td></td>
<td>(3) Riparian Areas</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(4) Best Management Practices for Water Quality</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(b) Social and Economical Sustainability</td>
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<td></td>
<td></td>
<td>(1) Social, cultural, and economic conditions</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<td>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</td>
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<tr>
<td>(2) Sustainable recreation, including recreation settings, opportunities, and access; and scenic character.</td>
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<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>(3) Multiple uses that contribute to local, regional, and national economies in a sustainable manner</td>
<td></td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(4) Ecosystem services</td>
<td></td>
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<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(5) Cultural and historic resources and uses</td>
<td></td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td>(6) Opportunities to connect people with nature</td>
<td></td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>219.9 Diversity of plant and animal communities</td>
<td>(a) Ecosystem plan components</td>
<td>(1) Ecosystem integrity</td>
<td>This amendment is consistent with moving toward restoring ecological integrity, post-project activities, by requiring mitigation and restoration of the PNF Activity Area for the SGP. The RCP does not address soil productivity which would not move the PNF Activity Area to a condition of 5 percent or less TSRC. However, the reclamation plan is designed to achieve soil and slope stability through management and BMPs of surface water and groundwater; grading and slope configurations; and establishing persistent vegetation cover (Section 4.5.2.2). Reclamation would occur on all areas of SGP-attributed TSRC except for where pit lakes and pit highwalls occur on NFS lands. The restoration of soil productivity could take an extremely long period of time, but reclamation would benefit soil improvement processes in the area.</td>
</tr>
<tr>
<td>(b) Additional species-specific plan components</td>
<td>(1) and (2) components to provide the ecological conditions necessary to contribute to the recovery of federally listed or proposed species (and viable species of conservation concern) beyond those required at part (a) of this section</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<tr>
<td>(c) Species of conservation concern</td>
<td>(1) Aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, wilderness, and other relevant resources and uses.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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</tr>
<tr>
<td>219.10 Multiple Use</td>
<td>(a) Integrated resource management for multiple use</td>
<td>(2) Renewable and nonrenewable energy and mineral resources.</td>
<td>This amendment is consistent with moving toward restoring ecological integrity, post-project activities, by requiring mitigation and restoration of the PNF Activity Area for the SGP. The RCP does not address soil productivity which would not move the PNF Activity Area to a condition of 5 percent or less TSRC. However, the reclamation plan is designed to achieve soil and slope stability through management and BMPs of surface water and groundwater; grading and slope configurations; and establishing persistent vegetation cover. Leaving the PNF Activity Area in a condition of 5 percent or less TSRC following completion of the activities (as stated in the Payette Forest Plan) is not feasible due to the nature of the mining activities (Section 4.5.2.2).</td>
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<td></td>
<td>(3) Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(4) Opportunities to coordinate with neighboring landowners to link open spaces and take into account joint management objectives where feasible and appropriate.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(5)</td>
<td>Habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments). This requirement is not directly related to this project-specific amendment.</td>
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<td>(6)</td>
<td>Land status and ownership, use, and access patterns relevant to the plan area. This requirement is not directly related to this project-specific amendment.</td>
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<td>(7)</td>
<td>Reasonably foreseeable risks to ecological, social, and economic sustainability. This requirement is not directly related to this project-specific amendment.</td>
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<td>(8)</td>
<td>System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (§ 219.8); This requirement is not directly related to this project-specific amendment.</td>
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<td>(9)</td>
<td>Public water supplies and associated water quality. This requirement is not directly related to this project-specific amendment.</td>
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<td>(10)</td>
<td>Opportunities to connect people with nature. This requirement is not directly related to this project-specific amendment.</td>
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<td>219.11 Timber requirements based on the NFMA</td>
<td>(a) Lands not suited for timber production</td>
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<td>(b) Timber harvest for purposes of timber production.</td>
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<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(c) Timber harvest for purposes other than timber production.</td>
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<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(d) Limitations on timber harvest</td>
<td>(1) No timber harvest for the purposes of timber production may occur on lands not suited for timber production.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(2) Timber harvest would occur only where soil, slope, or other watershed conditions would not be irreversibly damaged.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(3) Timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
</tr>
<tr>
<td>Planning Regulation Section</td>
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<td>(4)</td>
<td>Where plan components will allow clearcutting, seed tree cutting, shelterwood cutting, or other cuts designed to regenerate an even-aged stand of timber, the plan must include standards limiting the maximize size for openings that may be cut in one harvest operation, according to geographic areas, forest types, or other suitable classifications. This requirement is not directly related to this project-specific amendment.</td>
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<td>(5)</td>
<td>Timber will be harvested from NFS lands only where such harvest would comply with the resource protections set out in sections 6(g)(3)(E) and (F) of the NFMA (16 U.S.C. 1604(g)(3)(E) and (F)). This requirement is not directly related to this project-specific amendment.</td>
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<td>(6)</td>
<td>The quantity of timber that may be sold from the national forest is limited to an amount equal to or less than that which can be removed from such forest annually in perpetuity on a sustained yield basis. This requirement is not directly related to this project-specific amendment.</td>
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<td>(7)</td>
<td>The regeneration harvest of even-aged stands of trees is limited to stands that generally have reached the culmination of mean annual increment of growth. This requirement is not directly related to this project-specific amendment.</td>
</tr>
</tbody>
</table>
2.3  Visual Quality Objectives Project Specific Amendment

Forest: Boise and Payette National Forest

Alternatives: 2021 MMP and Johnson Creek Route Alternative

2.3.1  Plan Components

PNF and BNF: Standard SCST01

All projects shall be designed to meet the adopted Visual Quality Objectives (VQOs) as identified in Management Area direction and represented on the Forest VQO map.

BNF: Standard 1767 (MA 17)

Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FH 22.

BNF: Standard 1983 (MA 19)

Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FH 22 and FR 467.

BNF: Standard 2052 (MA 20)

Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413.

BNF: Standard 2155 (MA 21)

Meet the visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413, FR 416 W to Hennessey Meadow, and FR 440.

2.3.2  Proposed Amendment

The project specific amendments are applicable in the portions of MA 13 (PNF) and MA 17, 19, 20, and 21 (BNF) that are affected by components of the proposed SGP.

PNF and BNF: Standard SCST01

Waive the requirement to meet adopted Visual Quality Objectives (VQOs) as identified in Management Area direction and represented on the Forest VQO map for sections along the new and upgraded transmission lines (2021 MMP and Johnson Creek Route Alternative); sections along the Burntlog Route (2021 MMP); and the mine site (2021 MMP and Johnson Creek Route Alternative).

BNF: Standard 1767 (MA 17)
Waive the requirement to meet visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FH 22.

**BNF: Standard 1983 (MA 19)**

Waive the requirement to meet visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FH 22 and FR 467.

**BNF: Standard 2052 (MA 20)**

Waive the requirement to meet visual quality as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413.

**BNF: Standard 2155 (MA 21)**

Waive the requirement to meet visual quality objectives as represented on the Forest VQO Map, and where indicated in the table below as viewed from the following areas/corridors: FR 413, FR 416 W to Hennessey Meadow, and FR 440.

The suspension or modifications of these standards meet the following purpose and needs for the SGP:

- The Forest Service’s purpose is to consider approval of the Plan to mine and process gold, silver, and antimony from deposits at the mine site in central Idaho, for commercial sale. The purpose of the proposed SGP is consistent with Congress’ declaration in the Mining and Mineral Policy Act of 1970 (Public Law 91-631 as amended through Public Law 106-193).

- The Forest Service’s need for action is established by the agency’s responsibilities under the Locatable Minerals regulations at 36 CFR 228 Subpart A, which were promulgated under authority granted by the Mining Law of 1872 (Mining Law) (30 USC 22 et seq.) and the Organic Administration Act of 1897 (16 USC 478, 482, and 551). These regulations require that all locatable mineral prospecting, exploration, development, mining and processing operations, and associated means of access, shall be conducted in a manner that minimizes adverse environmental effects on NFS surface resources.

Generally, new and upgraded transmission lines would not meet the Preservation, Retention, or Partial Retention VQO. The line, color, form, and texture of the right of way (ROW) would visually dominate the landscape but would not be out of scale with the natural surroundings.

The footprint of the mine site would be within areas managed as a VQO of Retention or Partial Retention. The mine site would not meet either of these VQOs as the mine site components would introduce form, line, color, and texture found infrequently, or not at all, in the characteristic landscape, and to a degree that would dominate the characteristic landscape. New construction associated with the Burntlog Route would cross areas managed as Retention and Partial Retention VQOs. Except for the soil nail walls, access roads would generally conform to the Partial Retention VQO. Although new and upgraded portions of the Burntlog Route could introduce strong visual contrast in some areas, it typically would be limited to the immediate foreground as viewed from the road/trail introducing the contrast, although it
also may be visible from some trails and by individuals participating in dispersed recreation. New access roads would not be consistent with the Retention VQO as they would introduce new lines, colors, and textures that would be evident.

A full analysis of the impacts on VQOs is provided in Section 4.20 (Scenic Resources) in the EIS. It would not be appropriate to conduct a programmatic amendment because the project level assessment of changed VQOs is within the SGP area, where these project-specific amendments are proposed.

Table 3 provides documentation for the review of substantive requirements of planning regulations for the SGP project-specific amendment to waive the requirement to meet VQOs within portions of the proposed SGP area.
<table>
<thead>
<tr>
<th>Planning Regulation Section</th>
<th>Part</th>
<th>Subpart</th>
<th>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</th>
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</thead>
<tbody>
<tr>
<td>219.8 Sustainability</td>
<td>(a) Ecological Sustainability</td>
<td>(1) Ecosystem Integrity</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td></td>
<td>(2) Air, Soil, and Water</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(3) Riparian Areas</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(4) Best Management Practices for Water Quality</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(b) Social and Economical Sustainability</td>
<td>(1) Social, cultural, and economic conditions</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td></td>
<td>(2) Sustainable recreation, including recreation settings, opportunities, and access; and scenic character.</td>
<td>These amendments would allow for deviation from the mapped Preservation, Retention, or Partial Retention VQOs. This affects the landscape character and scenic quality of the area. The visual impacts would last throughout the life of the SGP. Some visual impacts would be reduced after reclamation activities occur; after Burnt Log Road and Burntlog Route were reclaimed, permanent visual contrast to the characteristic landscape generally would be minimal to moderate, although the soil nail walls would retain strong visual contrast in very localized areas (Section 4.20.2.2). The mine site would have a moderate-high visual contrast to the characteristic landscape, which would be visible from two key observation points (Sections 4.20.2.2 and 4.20.2.3). The existing upgrades to the transmission line would result in moderate to high visual contrast and the new transmission line would result in strong visual contrast (Sections 4.20.2.2 and 4.20.2.3). The line, color, form, and texture of the ROW would visually dominate the landscape but would not be out of scale with the natural surroundings.</td>
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<td>(3) Multiple uses that contribute to local, regional, and national economies in a sustainable manner</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(4) Ecosystem services</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(5) Cultural and historic resources and uses</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td>219.9 Diversity of plant and animal communities</td>
<td>(a) Ecosystem plan components</td>
<td>(1) Ecosystem integrity</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(2) Ecosystem diversity</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(b) Additional species-specific plan components</td>
<td>(1) and (2) components to provide the ecological conditions necessary to contribute to the recovery of federally listed or proposed species (<em>and viable species of conservation concern</em>) beyond those required at part (a) of this section</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(c) Species of conservation concern</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>219.10 Multiple Use</td>
<td>(a) Integrated resource management for multiple use</td>
<td>(1) Aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, wilderness, and other relevant resources and uses.</td>
<td>These amendments would allow for deviation from the mapped Preservation, Retention, or Partial Retention VQOs. This affects the landscape character and scenic quality of the area. The full amount of visual impacts would last throughout the life of the proposed SGP. Some visual impacts would be reduced after reclamation activities occur; after Burnt Log Road and Burntlog Route were reclaimed, permanent visual contrast to the characteristic landscape generally would be minimal to moderate, although the soil nail walls would retain strong visual contrast; albeit in localized areas (<em>Section 4.20.2.2</em>). The mine site would have a moderate- high visual contrast to the characteristic landscape, which would be visible from two key observation points (<em>Sections 4.20.2.2 and 4.20.2.3</em>). The upgraded transmission line would result in moderate to high visual contrast and the new transmission line would result in strong visual contrast (<em>Sections 4.20.2.2 and 4.20.2.3</em>). The line, color, form, and texture of the ROW would visually dominate the landscape but would not be out of scale with the natural surroundings.</td>
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<td>(2) Renewable and nonrenewable energy and mineral resources.</td>
<td>These amendments would allow for development of nonrenewable mineral resources.</td>
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<td>(3)</td>
<td>Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors. The upgraded transmission line occurs within existing ROW corridors.</td>
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<td>Opportunities to coordinate with neighboring landowners to link open spaces and take into account joint management objectives where feasible and appropriate. This requirement is not directly related to this project-specific amendment.</td>
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<td>Habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments). This requirement is not directly related to this project-specific amendment.</td>
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<td>(6)</td>
<td>Land status and ownership, use, and access patterns relevant to the plan area. This requirement is not directly related to this project-specific amendment.</td>
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<td>Reasonably foreseeable risks to ecological, social, and economic sustainability. This requirement is not directly related to this project-specific amendment.</td>
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<td>System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (§ 219.8); This requirement is not directly related to this project-specific amendment.</td>
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<td>219.11 Timber requirements based on the NFMA</td>
<td>(a) Lands not suited for timber production</td>
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<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(b) Timber harvest for purposes of timber production.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(d) Limitations on timber harvest</td>
<td>(1) No timber harvest for the purposes of timber production may occur on lands not suited for timber production.</td>
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<td>(2) Timber harvest would occur only where soil, slope, or other watershed conditions would not be irreversibly damaged.</td>
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<td>(3) Timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.</td>
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<td>(5) Timber will be harvested from NFS lands only where such harvest would comply with the resource protections set out in sections 6(g)(3)(E) and (F) of the NFMA (16 U.S.C. 1604(g)(3)(E) and (F)).</td>
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<td>(6) The quantity of timber that may be sold from the national forest is limited to an amount equal to or less than that which can be removed from such forest annually in perpetuity on a sustained yield basis.</td>
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<td>(7) The regeneration harvest of even-aged stands of trees is limited to stands that generally have reached the culmination of mean annual increment of growth.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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</table>
2.4 Fish Passage Diversion Project Specific Amendment

**Forest:** Payette National Forest

**Alternatives:** 2021 MMP and Johnson Creek Route Alternative

### 2.4.1 Plan Components

**PNF: Standard SWST09**

In fish-bearing waters, do not authorize new surface diversions unless they provide upstream and downstream fish passage and, if needed, include either fish screens or other means to prevent fish entrapment/entrapment.

### 2.4.2 Proposed Amendment

The project specific amendment is applicable in the portions of MA 13 (PNF) that are affected by components of the proposed SGP.

**PNF: Standard SWST09**

Waive the requirement of new surface diversions to provide upstream and downstream fish passage within the footprint of mining operations.

The suspension or modifications of these standards meet the following purpose and needs for the SGP:

- The Forest Service’s purpose is to consider approval of the Plan to mine and process gold, silver, and antimony from deposits at the mine site in central Idaho, for commercial sale. The purpose of the proposed SGP is consistent with Congress’ declaration in the Mining and Mineral Policy Act of 1970 (Public Law 91-631 as amended through Public Law 106-193).

- The Forest Service’s need for action is established by the agency’s responsibilities under the Locatable Minerals regulations at 36 CFR 228 Subpart A, which were promulgated under authority granted by the Mining Law of 1872 (Mining Law) (30 USC 22 et seq.) and the Organic Administration Act of 1897 (16 USC 478, 482, and 551). These regulations require that all locatable mineral prospecting, exploration, development, mining and processing operations, and associated means of access, shall be conducted in a manner that minimizes adverse environmental effects on NFS surface resources.

For the 2021 MMP and Johnson Creek Route Alternative, Meadow Creek would be diverted around the TSF and TSF Buttress in surface water diversions with the main channel on one side and a smaller channel on the other side. The routing of Meadow Creek into two diversion channels would create a fish passage barrier due to the steep gradient necessary for the transition from the valley bottom to the location of the main diversion channel (Section 4.12.2.2).

A full analysis of the impacts of diversions that do not allow for fish passage within the footprint of the mine site is provided in Section 4.12.2 (Fish Resources and Fish Habitat) in the EIS. It would not be
appropriate to conduct a programmatic amendment because the project level assessment of diversions that do not allow for fish passage is within the SGP area where these project-specific amendments are proposed.

The following table provides documentation for the review of substantive requirements of planning regulations for the SGP project-specific amendment to suspend the requirement to provide fish passage in surface diversions within portions of the proposed SGP area.
Table 4  Fish Passage Diversion Project Specific Plan Amendment Review

<table>
<thead>
<tr>
<th>Planning Regulation Section</th>
<th>Part</th>
<th>Subpart</th>
<th>Does the plan amendment meet this planning rule requirement? (Add rationale if Yes or No and cite EIS/EA)</th>
</tr>
</thead>
</table>
| 219.8 Sustainability         | (a)  | Ecological Sustainability | (1) Ecosystem Integrity  
Under the 2021 MMP and Johnson Creek Route Alternative, the Meadow Creek diversion that would not allow for fish passage would be in place for 10 to 17 years. After that time, habitat for listed fish species in upper Meadow would be permanently block due to the TSF/TSF Buttress, while other habitat would be made available by the removal of fish-passage barriers (Section 4.12.2.2). The SGP design features and mitigations developed for fish habitat are developed to maintain and restore ecosystem integrity and the intent of compensatory mitigation would be to offset impacts that cannot be avoided or minimized by regulation or design features (e.g., blocked fish access to upper Meadow Creek) (Section 2.4.9). |
|                             | (2)  | Air, Soil, and Water      | This requirement is not directly related to this project-specific amendment. |
|                             | (3)  | Riparian Areas            | Under the 2021 MMP and Johnson Creek Route Alternative, the Meadow Creek diversion that would not allow for fish passage would be in place for 10 to 17 years. After that time, habitat for listed fish species in upper Meadow would be permanently block due to the TSF/TSF Buttress, while other habitat would be made available by the removal of fish-passage barriers (Section 4.12.2.2). The SGP design features and mitigations developed for fish habitat are developed to maintain and restore ecosystem integrity and the intent of compensatory mitigation would be to offset impacts that cannot be avoided or minimized (e.g., blocked fish access to upper Meadow Creek) (Section 2.4.9). |
|                             | (4)  | Best Management Practices for Water Quality | This requirement is not directly related to this project-specific amendment. |
|                             | (b)  | Social and Economical Sustainability | (1) Social, cultural, and economic conditions  
This requirement is not directly related to this project-specific amendment. |
|                             |      |                        | (2) Sustainable recreation, including recreation settings, opportunities, and access; and scenic character.  
This requirement is not directly related to this project-specific amendment. |
|                             |      |                        | (3) Multiple uses that contribute to local, regional, and national economies in a sustainable manner  
This requirement is not directly related to this project-specific amendment. |
<table>
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<td></td>
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<td>(4) Ecosystem services</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(5) Cultural and historic resources and uses</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(6) Opportunities to connect people with nature</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<tr>
<td>219.9 Diversity of plant and animal communities</td>
<td>(a) Ecosystem plan components</td>
<td>(1) Ecosystem integrity</td>
<td>Under the 2021 MMP and Johnson Creek Route Alternative, the Meadow Creek diversion that would not allow for fish passage would be in place for 10 to 17 years. After that time, habitat for listed fish species in upper Meadow would be permanently blocked due to the TSF/TSF Buttress, while other habitat would be made available by the removal of fish-passage barriers (Section 4.12.2.2). The mitigations developed for fish habitat are developed to maintain and restore ecosystem integrity and the intent of compensatory mitigation would be to offset impacts that cannot be avoided or minimized (e.g., blocked fish access to upper Meadow Creek) (Section 2.4.9).</td>
</tr>
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<td></td>
<td>(b) Additional species-specific plan components</td>
<td>(1) and (2) components to provide the ecological conditions necessary to contribute to the recovery of federally listed or proposed species (and viable species of conservation concern) beyond those required at part (a) of this section</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(c) Species of conservation concern</td>
<td>The mitigations developed for fish habitat are developed to maintain and restore ecosystem integrity and the intent of compensatory mitigation would be to offset impacts that cannot be avoided or minimized (e.g., blocked fish access to Upper Meadow Creek) (Section 2.4.9). Section 7 ESA consultation will be conducted for the preferred alternative.</td>
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<td>There are no species known to occur within the proposed SGP area with a substantial concern about the species capability to persist over the long-term in the plan area (Section 4.12.2).</td>
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<td>(1) Aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, wilderness, and other relevant resources and uses.</td>
<td>The proposed plan amendment allows for the implementation of the proposed SGP. The effects of the surface diversions that do not allow for fish passage, as well as mitigation and reclamation actions developed to reduce impacts of the proposed SGP, are analyzed in the EIS (Section 4.12.2).</td>
</tr>
<tr>
<td>219.10 Multiple Use</td>
<td></td>
<td>(2) Renewable and nonrenewable energy and mineral resources.</td>
<td>This amendment would allow for development of nonrenewable mineral resources.</td>
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<td></td>
<td>(a) Integrated resource management for multiple use</td>
<td>(3) Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
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<td>(4) Opportunities to coordinate with neighboring landowners to link open spaces and take into account joint management objectives where feasible and appropriate.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(5) Habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments).</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(6) Land status and ownership, use, and access patterns relevant to the plan area.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(7) Reasonably foreseeable risks to ecological, social, and economic sustainability.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(8) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (§ 219.8);</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(9) Public water supplies and associated water quality.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(10) Opportunities to connect people with nature.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>219.11 Timber requirements based on the NFMA</td>
<td>(a) Lands not suited for timber production</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td></td>
<td>(b) Timber harvest for purposes of timber production.</td>
<td></td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(c) Timber harvest for purposes other than timber production.</td>
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<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(d) Limitations on timber harvest</td>
<td></td>
<td>(1) No timber harvest for the purposes of timber production may occur on lands not suited for timber production.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(2) Timber harvest would occur only where soil, slope, or other watershed conditions would not be irreversibly damaged.</td>
<td>This requirement is not directly related to this project-specific amendment.</td>
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<td>(3) Timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.</td>
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<td>(4) Where plan components will allow clearcutting, seed tree cutting, shelterwood cutting, or other cuts designed to regenerate an even-aged stand of timber, the plan must include standards limiting the maximize size for openings that may be cut in one harvest operation, according to geographic areas, forest types, or other suitable classifications.</td>
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3.0 REFERENCES


