



Technical Memorandum

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Prepared for: Perpetua Resources Idaho, Inc. (PRII)

Project Title: Stibnite Gold Project

Technical Memorandum

Subject:

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To: Dan Stanaway, Principal, Environmental Scientist, Brown and Caldwell

From: Mark Miller, Fisheries Biologist, BioAnalysts

Prepared by: Mark Miller, Fisheries Biologist

Section 1: Purpose

BioAnalysts has prepared this technical memorandum for Perpetua Resources Idaho, Inc. (Perpetua Resources or PRII) to summarize potential impacts to fisheries resources as a result of water withdrawal proposed for the Stibnite Gold Project (SGP). Perpetua Resources (PRII 2021) developed a refined Proposed Action (ModPRO2) that updates the details of the Plan of Restoration and Operations (PRO) for the SGP, decreasing the project's footprint and potential environmental impacts. Specifically, elements of the ModPRO2 revisions to the plan reduced water management and treatment needs as well as lowered stream temperatures (PRII 2021; USFS 2022). Significant Issues and indicators for fisheries resources and habitat (U.S. Forest Service [USFS] 2022; Page 1-16) include:

- Direct loss of critical habitat for Chinook salmon and bull trout
- Changes in occupancy probability for bull trout and westslope cutthroat trout
- Changes in access to bull trout lake habitat
- Changes in stream and lake habitat directly impacted by channel removal.
- Changes in total useable intrinsic potential habitat for spring/summer Chinook salmon and steelhead.
- Changes in the length of available bull trout habitat.
- Length of westslope cutthroat trout habitat.
- Stream flow (peak and baseflow) and water quality (water temperature and chemistry)

Indicators were developed during the NEPA process to assess impacts to fisheries resources and fish habitat (USFS 2022). Several Indicators from the SDEIS were reviewed and included in this memo to assess habitat and fish passage conditions. Those indicators included stream flow, intrinsic potential (IP) modeling, barriers, and selected watershed condition indicators (WCI). Additional information generated for water rights and potential impacts of water withdrawal were included in this memo. There has been a considerable amount of information compiled and assessed on the potential impacts of the SGP and thus the findings within those documents are incorporated when referenced within this memo.

Section 2: Project Background

As part of the SGP, Perpetua Resources has applied for a water right permit to divert up to 9.6 cubic feet per second (cfs) from groundwater and the East Fork South Fork Salmon River (EFSFSR) for industrial purposes at the Stibnite Gold Project. The application for permit (77-14378) also seeks authorization to capture, store, and use for industrial purposes any stormwater runoff that has contacted Project facilities (contact water). Additionally, Perpetua Resources currently controls decreed water rights (77-7122, 77-7285, and 77-7293) for mining and industrial purposes that are being modified through transfer applications to support the SGP. A single point of diversion (POD) from the EFSFSR and multiple wells, underdrains, and contact water ponds are proposed under the application and transfers.

As summarized by HDR (2023), additional information was provided on these water rights and PODs in an effort to seek technical assistance review on potential impacts from proposed diversions to fish passage and fish habitat from the Idaho Department of Fish and Game (IDFG) and the Office of Species Conservation (OSC). Through extensive discussions, Perpetua proposed, in a letter to the Governor's Office of Energy and Mineral Resources



dated June 27, 2022, a water right condition that restricts diversions to limit habitat impacts (PRII 2022). The proposed condition is provided below.

Net diversions from EFSFSR and groundwater under water rights 77-7122, 77-7285, 77-7293, and 77-14378 shall not cause more than 20 percent depletion to the unimpaired streamflow in the EFSFSR below its confluence with Sugar Creek when unimpaired streamflow is less than 25 cfs. For purposes of this condition:

- 1. Percent depletion is equal to net diversion divided by unimpaired streamflow.*
- 2. Net diversion is the sum of groundwater and EFSFSR diversions minus discharge of treated water to the EFSFSR and its tributaries.*
- 3. Unimpaired streamflow is defined as the gaged flow at Sugar Creek (USGS 13311450), plus the gaged flow at EFSFSR above Sugar Creek (USGS 1331250), plus the net diversion from EFSFSR and groundwater under water rights 77-7122, 77-7285, 77-7293, and 77-14378.*
- 4. Calculations shall be based on running 3-day averages of net diversion and gaged stream flows.*
- 5. Diversion rate from the EFSFSR surface intake POD shall not exceed 20 percent of the unimpaired EFSFSR stream flow below its confluence with Sugar Creek (point of quantification).*

The voluntary diversion restriction will prevent dewatering of the EFSFSR during low stream flow periods.

In response, OSC and IDFG provided recommendations to Idaho Department of Water Resources (IDWR) in addition to measures and draft water right conditions outlined in Perpetua's technical memo for developing water right conditions for 77-14378.

Section 3: Fisheries Resources-Effects of Water Withdrawal

Potential risks to fisheries resources from reduced stream flows as a result of the SGP are the focus of this memo. The main area of concern is fish habitat and passage conditions within the EFSFSR from the confluence with Sugar Creek to points of diversion (POD) on the EFSFSR (i.e., surface intake and dewatering wells) and Meadow Creek (i.e., existing, dewatering, and supply wells) (USFS 2022). Salmonid species that occur in all or portions of the Headwaters EFSFSR subwatershed include Snake River Basin spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River Basin steelhead (*O. mykiss*), Columbia River bull trout (*Salvelinus confluentus*) and westslope cutthroat trout (*O. clarkii lewisi*), and (Kuzis 1997; Nelson 2009; MWH 2017; BC 2020) ¹.

In general, risks associated with proposed mining operations generally fall within three major categories such as altered hydrology and temperature, habitat modification and loss, and changes to water quality (Sergeant et al. 2022). Mining can impact the natural flow patterns of ground and surface water by dewatering open pits, filling streams and wetlands with waste rock dumps and diverting or rerouting stream channels. Changes in streamflow and water temperature patterns to local fish populations can influence life history events such as spawning and migration and/or alter growth and survival. Similarly, disturbances that result in habitat modification and loss can simplify or degrade habitat, promote fine sediment, and hinder fish passage via stream crossings, bridges, and culverts as well as restrict access to floodplains ultimately reducing habitat connectivity and capacity of salmonid habitat.

¹ Mountain whitefish (*Prosopium williamsoni*) are salmonids that also occur in the upper EFSFSR (BC 2020).



Section 4: Discussion

In this section, the discussion is developed around potential impacts of the SGP specific to changes in streamflow as a result of water use in the EFSFSR and Meadow Creek within the Headwaters EFSFSR subwatershed. The discussion focuses on fish passage and habitat within these streams. This memo does not cover water quality or stream temperature changes as a result of the SGP.

The Stibnite Gold Project Supplemental Draft Environmental Impact Statement (SDEIS) evaluated several SGP alternatives including a no action alternative. For this discussion, the most relevant comparison and conclusions for water management can be drawn from the No Action Alternative (current conditions) and the Preferred Alternative as described in the SDEIS. The SDEIS evaluated potential effects to species and aquatic habitats with the assumption that potential impacts would occur to habitat regardless of the presence of special status species and habitat use in the Headwater EFSFSR subwatershed². It is important to this discussion that potential effects to species would occur in a manner that reflects actual exposure to the species and life stages present. For example, the out-planting of spring/summer Chinook may continue during the SGP and would likely be released upstream of the EFSFSR fishway tunnel and the tunnel headworks where the POD is located. Those adult spring/summer Chinook salmon would not be exposed to fish passage and habitat conditions downstream. However, the juveniles produced from those adult outplants would eventually be exposed to aquatic habitat conditions during juvenile rearing and outmigration. Spring/summer Chinook salmon and steelhead that eventually recolonize the Headwaters EFSFSR subwatershed via the proposed EFSFSR tunnel fishway would be exposed to aquatic habitat conditions during all freshwater life stages. The same potential exposure is true for bull trout and westslope cutthroat trout that occur naturally within the subwatershed. However, a given species and life stage combination, e.g., returning adult Chinook salmon, would not necessarily be exposed to all habitat conditions as not all species-life stage combinations are present at all times of the year.

There are some SGP activities that would require temporary water diversions such as stream restoration and enhancement as well as culvert repair or replacement (PRII 2021; USFS 2022). The direct effects of those activities are considered negligible, temporary, and localized (USFS 2022). Those activities would create temporary barriers to migration, rerouting of streamflow, and local stream disturbances that would impact aquatic habitat conditions. However, these SGP activities are an integral part of restoring stream connectivity and improving habitat conditions within the Headwaters EFSFSR subwatershed. In addition, SGP activities along the access route may improve habitat access with repair and replacement of culverts along the proposed Burntlog Route (USFS 2022).

The SDEIS did not compare WCI metrics before and after restoration/enhancement which would have been instructive in demonstrating actual (i.e., baseline) habitat conditions contrasted with proposed habitat conditions within the subwatershed. Table 1 presents a simple comparison of several watershed condition indicators (i.e., LWD/mile, pools/mile, large pools/mile) often used to describe habitat diversity and complexity. Expression of these indicator metrics shows improvement in habitat conditions within those reaches from baseline conditions. Additionally, fish passage barriers expressed at the reach level showed improvement over baseline. The SDEIS (USFS 2022; Page 4-344) also documented these habitat access improvements for spring/summer Chinook and steelhead and considered them major, permanent, and locally beneficial. For bull trout and westslope cutthroat, the effects are expected to be major, permanent, and localized.

² . The SDEIS recognizes significant existing barriers in the Headwater EFSFSR subwatershed and that such barriers limit the current distribution and occurrence of ESA-listed species.



Table 1. Selected Watershed Condition Indicators within defined reaches of the Headwaters EFSFSR subwatershed. The baseline phase is considered current conditions (i.e., No Action Alternative) compared to ModPRO2 interim and restored phases of the SGP.

WCI Indicator	Mine Phase	Reach							
		Meadow Creek Downstream of Buttress		EFSFSR Between Meadow Creek and YPP		EFSFSR at YPP		EFSFSR Between YPP and Sugar Creek	
		Value	WCI Score ¹	Value	WCI Score ¹	Value	WCI Score ¹	Value	WCI Score ¹
Fish Passage	Baseline	Barrier	FUR	Barrier	FUR	Barrier	FUR	No Barrier	FA
	Interim	No Barrier	FA	No Barrier	FA	No Barrier	FA	No Barrier	FA
	Restored	No Barrier	FA	No Barrier	FA	No Barrier	FA	No Barrier	FA
Large Woody Debris	Baseline	17	FUR	14	FUR	0	FUR	2	FUR
	Interim	23	FR	14	FUR	0	FUR	7	FUR
	Restored	49	FR	48	FA	40	FR	48	FA
Pools (all pools/mile)	Baseline	36	FR	31	FR	15	FR	21	FR
	Interim	42	FA	27	FR	0	FUR	22	FUR
	Restored	49	FA	40	FR	32	FA	21	FR
Large Pools (>1m deep/mile)	Baseline	1	FUR	3	FUR	3	FUR	0	FUR
	Interim	8	FUR	3	FUR	0	FUR	2	FUR
	Restored	5	FUR	5	FUR	6	FUR	0	FUR

1. There are three functional condition levels identified for each pathway/watershed condition indicator (WCI). The conditional ratings are typically bounded metrics (i.e., pools/mile, LWD/mile, etc.) that describe the desired range in values for that functional condition (see USFS 2003, Appendix B).

FA=Functioning Appropriately

FR=Functioning at Risk

FUR=Functioning at Unacceptable Risk

The SDEIS (USFS 2022; Page 4-354) reported percent changes in streamflow annually during the low flow period that range from a net positive 3.7% (Meadow Creek) to a loss of -36.4% (Meadow Creek) from baseline. Changes in streamflow can affect stream width (wetted and bankfull) which is one of the primary model variables in IP habitat (Cooney and Holzer 2006). It is important to restate that the IP habitat evaluation is a relative comparison and does not include actual access to or potential utilization of the available IP habitat at baseline. Regardless, for spring/summer Chinook salmon and steelhead predicted changes in streamflow were noted as affecting the amount of intrinsic potential habitat in Meadow Creek, and these changes were attributed to dewatering (USFS 2022; Page 4-363 and 4-371). Meadow Creek regains some of the IP habitat by mine year 15 as the effects of mine operations phase dewatering and water supply pumping end. There is no other mention of streamflow management activities affecting IP habitat in other reaches. The overall conclusion on IP habitat is a net positive gain in IP habitat of 2% for spring/summer Chinook salmon and 16.5% for steelhead by the end of the life of the mine (USFS 2022). It should be noted that the IP model only evaluates changes in IP relative to stream width (wetted and bankfull), gradient, and valley confinement (Cooney and Holzer 2006).

More recent information was developed to help address fish passage conditions for the EFSFSR downstream from outlet of Yellow Pine Pit Lake to the Sugar Creek confluence (RioASE 2023a, 2023b; BioAnalysts 2023). This section of stream encompasses all subwatershed water management activities that could potentially affect streamflow including the proposed POD at the headworks of the EFSFSR tunnel. Rio Applied Science and Engineering (RioASE)



provided updated analysis to support fish passage analysis with predicted flow reductions from SGP dewatering and water supply withdrawals as well as limitations to those withdrawals that may be applied during Project water rights permitting. The effort also included updated information on species-specific periodicity based on recent PIT tag detections of ESA-listed and special status fish species detected within the reach (BioAnalysts 2023). Stream channel cross-sectional hydraulic modeling (depth and velocity) was performed to assess fish passage conditions (RioASE 2023b). Criteria used for the analyses included the 95% exceedance flows that represent low flow conditions during migration (NMFS 2022), minimum water column depth requirements by species and life stage (CDFW 2017), as well as species specific swimming capacities (McMillen Jacobs 2018; Bell 1991).

Based on the analysis and criteria applied, hydraulic modeling suggests that some cross-sections in the EFSFSR and Sugar Creek would not meet the criteria applied at baseline or under proposed conditions. Specifically, the percentage of the reach meeting depth criteria for 95% exceedance flows for existing conditions varied from 91% to 100% for the species and life stages evaluated. Under the proposed condition there was a slight decrease noted with a reported range from 87% to 100% under the proposed condition. Most of the cross sections for existing and proposed conditions that were reported out of compliance were located within step-pool dominated subreaches at the step-pool drop/crest. At the 5% exceedance flows (i.e., high stream flows) the length of stream not meeting both depth and average velocity given the burst swimming capabilities of all fish was about 1%.

Existing conditions on the EFSFSR and Sugar Creek exhibit small areas where minimum depth requirements are not met, but passage has been historically maintained despite these suboptimal conditions. Given the existing conditions and relatively small changes predicted in the modeling presented by RioASE (2023b), it is unlikely that habitat access for juvenile and adult migrations would be prevented for the reach evaluated under proposed conditions. Moreover, there were no intermittent or dry stream sections, chutes or waterfalls or stream gradient barriers reported at baseline for this reach that currently limit habitat access for juvenile or adult migrations (Miller 2021). The selected watershed condition indicators for that reach also appear to improve or remain the same as baseline (Table 1).



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