TECHNICAL MEMORANDUM

DATE November 6, 2023

TO Save the South Fork Salmon
Nez Perce Tribal Executive Committee

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SUBJECT

Rebuttal to Perpetua Resources Idaho Expert Report – Water Right Application, prepared on behalf of Protestants Save the South Fork Salmon and the Nez Perce Tribal Executive Committee, before the Department of Water Resources of the state of Idaho, in the matter of applications for permit nos. 77-14377, 77-14378, and 77-14379; applications for transfer nos. 85396 (77-7122), 85397 (77-7285), 85398 (77-7293), and 85399 (77-7141); and application for exchange nos. 85538 (77-7293) in the name of Perpetua Resources of Idaho, Inc.

I. INTRODUCTION

BAS Groundwater Consulting Inc. ("BAS") has prepared this rebuttal response to Perpetua Resources Idaho, Inc. ("Perpetua")'s *Expert Report – Water Right Application* (Scanlan and Stanaway, 2023) and associated water rights applications for permit on behalf of protestants Save the South Fork Salmon and the Nez Perce Tribe. Save the South Fork Salmon and the Nez Perce Tribe are protesting Perpetua's applications for permit nos. 77-14377, 77-14378, and 77-14379; applications for transfer nos. 85396 (77-7122), 85397 (77-7285), 85398 (77-7293), and 85399 (77-7141); and application for exchange 85538 (77-7293) for the Stibnite Gold Project ("SGP") located in Valley County, Idaho, before the Idaho Department of Water Resources.

The documents pertaining to this matter are extensive and we have reviewed as much information as possible within the window of time provided to complete our analysis. We reserve the right to update our opinion based on additional information provided by parties in the case.

II. BACKGROUND – PERPETUA'S DETERMINATION OF WATER NEEDS AND APPLICATIONS FOR WATER RIGHTS

Onsite Non-Potable Water Permit Applications (10.68 cubic feet per second total)

Perpetua developed a site-wide water balance ("SWWB") model to predict monthly non-potable water needs by mine year for the SGP (Scanlan and Stanaway, 2023). Perpetua estimated water table drawdown and streamflow impacts of its non-potable water needs under the refined Modified Plan of Restoration and Operations ("ModPRO2") Alternative by using the Stibnite Hydrologic Site Model ("SHSM") developed by Perpetua. The SHSM consists of a long-term meteoric water balance ("MWB") model and a numerical groundwater flow model, which Perpetua developed by using MODFLOW 6 software (Brown and Caldwell, 2021a). The inputs to the SHSM also included a mine feature-specific water balance developed by Perpetua for the Tailings Storage Facility ("TSF") Buttress (Brown and Caldwell, 2021a).

Perpetua's 9.6 cubic feet per second ("cfs") application for new annual water rights (Permit Application No. 77-14378 for groundwater, surface water, and contact water diversions) is part of the total 10.68 cos requested by Perpetua for onsite non-potable water rights in various permit application requests—Transfer Permit No. 77-7122 / Application No. 85396 to transfer 0.33 cfs of existing surface water rights to a new Point of Diversion; Transfer Permit No. 77-7285 / Application No. 85398 to transfer 0.50 cfs of existing groundwater rights to a new Point of Diversion and Place of Use; and Transfer Permit No. 77-7293 / Exchange Application No. 85538 to transfer 0.25 cfs of existing surface water rights to a new Point of Diversion and Place of Use.

Onsite Potable Water Permit Applications (0.46 cubic feet per second total)

Perpetua determined its onsite potable water needs based on the anticipated population served and typical flow rates for the associated facilities. Perpetua has submitted three permit applications to meet its projected onsite potable water needs—Transfer Permit No. 77-7141 / Application No. 85399 (Stibnite Lodge / Worker Housing Facility); New Application for Permit No. 77-14377 (Stibnite Lodge / Worker Housing Facility); and New Application for Permit No. 77-14379 (Truck Shop / Ore Processing Facility).

III. TECHNICAL ASSESSMENT OF PERPETUA'S NEW APPLICATION FOR PERMIT OF 9.6 CFS OF ANNUAL WATER RIGHTS (NO. 77-14378)

This section discusses our technical assessment of Perpetua's new water right application no. 77-14378. We have concluded that: a) Perpetua has failed to demonstrate that it needs the 9.6 cfs it requested to operate the SGP; and b) Perpetua did not estimate the impacts to groundwater and streamflow from removing 9.6 cfs (permit application no. 77-14378), let alone the impacts from its total water right request of 11.14 cfs of onsite use (which includes 0.46 cfs for groundwater diversion for onsite potable usage).

A. Perpetua's application for a 9.6 cfs annual water diversion rate is three times higher than its estimated, average annual water demand diversion rate of 2,272 af/yr or 3.15 cfs for the SGP.

Perpetua defines its industrial water requirements for the SGP operations as mill demand for ore processing, dust suppression, drilling water, and dewatering (Brown and Caldwell, 2021b). Perpetua reported its anticipated peak diversion rates to satisfy these anticipated industrial water requirements for SGP operations as (Brown and Caldwell, 2021b):

- Mill Diversion Demand = 4.5 cfs (defined by Perpetua as water needed in addition to the TSF reclaim water);
- Dust Control = 0.7 cfs;
- Drilling Water = 0.1 cfs; and
- Excess Dewatering Water = 4.3 cfs.

The sum of these peak, non-simultaneous, industrial water requirements determined by Perpetua is 9.6 cfs, which is equivalent to the 9.6 cfs diversion rate requested by Perpetua in the application for permit no. 77-14378.

Perpetua also reported (Brown and Caldwell, 2021b) its anticipated average annual demand volumes for SGP operations in af/yr. We converted these volumes to approximate constant demand rates. They are:

- Mill Diversion Demand = 1,438 acre-feet per year (af/yr) (1.99 cfs);
- Dust Control = 186 af/yr (0.26 cfs);
- Drilling Water = 40 af/yr (0.06 cfs); and
- Excess Dewatering Water = 608 af/yr (0.84 cfs).

The sum of these average industrial water demands determined by Perpetua is 2,272 af/yr or a constant demand rate of 3.15 cfs.

Perpetua has stated that the new water rights diversions requested in the application for permit no. 77-14378 were developed to meet SGP project needs (Scanlan and Stanaway, 2023). Perpetua, however, has demonstrated that

the anticipated SGP water diversion needs are, on average, approximately 3.2 cfs, not the 9.6 cfs diversion rate requested in Perpetua's application for permit no. 77-14378. Perpetua admits that the "total diversion rate sought for industrial and mining uses is the 9.6 cfs sum of the peak demand for freshwater diversion to the mill, dust control, exploration drilling water, and excess dewatering flows, all occurring simultaneously. Although the chances of simultaneously having peak demands for all uses is low, the full amount is sought for flexibility purposes" (Scanlan and Stanaway, 2023).

Perpetua has not requested rights to water diversions that reasonably meet its project water needs. Rather, it has requested rights to water diversions for an extraordinary, unlikely situation that is more than three (3) times its estimated average need. Perpetua is requesting authorization of a higher rate of water diversions than needed for SGP operations, imposing unnecessary impacts on groundwater and surface flows, to allow itself to maintain "flexibility" in SGP operations.

B. Perpetua failed to estimate Impacts to EFSFSR streamflow from withdrawing 9.6 cfs.

Perpetua developed the SHSM to predict the groundwater and East Fork South Fork Salmon River ("EFSFSR") streamflow impacts of planned water diversions for the SGP. The estimated water diversion demands were estimated by Perpetua using its SWWB model and its SHSM model. Perpetua has stated that industrial make-up water composition will prioritize contact water and dewatering water sources, followed by groundwater supply wells, then surface water (Brown and Caldwell, 2021a). Perpetua used the results of its SWWB model to quantify monthly industrial water demand needs (delineated by Perpetua as water needs for ore processing, dust control, drilling water, and dewatering of mine workings (Perpetua, 2021)), and it used the SHSM to estimate monthly pit dewatering requirements. Perpetua simulated (modeled) diversions with groundwater supply wells and surface water from the EFSFSR, as needed, based on the modeled estimates of pit dewatering. Perpetua predicted levels of decline of groundwater elevations (drawdown) and changes to streamflow at specific locations and compared the results of model runs representing the ModPRO2 alternative and a No Action alternative (if the SGP were not to occur).

There are three critical flaws in Perpetua's modeling analysis of impacts for its 9.6 cfs water right application:

i. Perpetua did not model the simultaneous maximum diversion rate of either 9.6 cfs or the total 11.14 cfs for onsite diversion in its ModPRO2 alternative model;
ii. Perpetua did not account for operational conditions under which it may prioritize one water source over another; and
iii. Perpetua did not simulate the diversion of runoff in its ModPRO2 alternative model.

These flaws are discussed below.

i. Because Perpetua Did Not Model the Simultaneous Maximum Water Diversion Rate of 9.6 or 11.14 cfs, Impacts to EFSFSR Streamflow Cannot be Determined.

Perpetua has requested 9.6 cfs of water diversions for industrial use, yet Perpetua did not simulate 9.6 cfs of industrial water diversions in the SHSM to estimate impacts to EFSFSR streamflow. In total, Perpetua has requested 11.14 cfs in onsite water diversion including industrial and potable water uses (Perpetua, 2021). Perpetua instead provided modeled, annual pit dewatering rates, pumping rates from groundwater supply wells, and diversion rates from the EFSFSR. Its highest combined diversion was 4.4 cfs in mine year 5 (Tables B-1, and B-4 through B-6) (Brown and Caldwell, 2021a). The next highest combined diversion was 3.4 cfs in mine year 2, and all remaining, modeled, combined diversions during mining operations (mine years 1 through 12) were less than 3 cfs.

Perpetua has failed to predict impacts to groundwater (drawdown), impacts to EFSFSR streamflow, and impacts to aquatic ecosystems were it to consistently utilize its full water right of 9.6 cfs in one or more of years of operations at the SGP. Additionally, Perpetua did not include its planned onsite potable water use of 0.46 cfs[1] in its SHSM modeling evaluation. Perpetua's failure to include this water use in its impacts assessment adds to the overall error of its predicted impacts to EFSFSR streamflow. Without a realistic estimate of impacts to EFSFSR streamflow, realistic and reasonable mitigation measures cannot be assessed.

ii. Because Perpetua Did Not Account for Operational Conditions in Which It May Prioritize One Water Source Over Another, Maximum Impacts to EFSFSR Streamflow Cannot be Determined.

Perpetua did not account for operational conditions in which it may change the priority of sourced water in its SHSM. There is nothing in Perpetua's water rights application that would prevent it from sourcing all or most of the requested 9.6 cfs from just one source at any time—such as groundwater supply wells if climatic conditions are unusual or surface water diversions if pumping wells become inactive, etc. Perpetua also did not simulate how its will divert water when EFSFSR streamflow is low if the Idaho Department of Water Resources were to adopt the condition it has proposed, which limits it to no more than 20 percent depletion when flows are under 25 cfs (see Section IV below). The impacts to EFSFSR streamflow if Perpetua were to remove most or all of their water from one diversion source have not been estimated and, therefore, maximum impacts to EFSFSR streamflow and/or maximum groundwater drawdown impacts have not been determined.

[1] Perpetua requested a total of 0.46 cfs of groundwater rights diversions in Transfer Permit No. 77-7141 / Application No. 85399 (Stibnite Lodge / Worker Housing Facility), New Application for Permit No. 77-14377 (Stibnite Lodge / Worker Housing Facility), and New Application for Permit No. 77-14379 (Truck Shop / Ore Processing Facility.

iii. Perpetua Underestimated EFSFSR Streamflow Impacts Because It Did Not Model the Diversion of Runoff.

Perpetua did not include the impacts resulting from the capture, diversion, and storage of water runoff in its SHSM. Perpetua defines runoff as stormwater from project facilities that does not enter a natural watercourse, and states that Perpetua can collect runoff without a water right (Scanlan and Stanaway, 2023). This may be true, but Perpetua also identifies that runoff could be a significant water supply component for the project (Scanlan and Stanaway, 2023). As a significant water supply component, the impacts of removing runoff from the natural water cycle should be included in the SHSM to predict impacts to EFSFSR streamflow and groundwater levels.

Without interference, runoff flows downgradient either to a stream, river, wetland, or pool or infiltrates to groundwater. When Perpetua captures a potentially significant volume of water (runoff) from this cycle, it will impact groundwater levels and EFSFSR streamflow. Without accounting for the capture of runoff in the SHSM, the modeled stream flows under mining conditions will be over-estimated, which will make the impacts assessment of SGP operations on EFSFSR streamflow appear less than they are. A complete estimate of streamflow impacts from SGP operations is not possible without consideration of the capture of runoff in the analysis.

IV. PERPETUA INCORRECTLY CALCULATED EFSFSR STREAMFLOW IMPACTS UNDER PROPOSED DEPLETION LIMIT DURING LOW STREAMFLOW

Perpetua has indicated that it will agree to a water right condition that restricts water diversions during specific periods of time when there are low flows in the EFSFSR to limit habitat impacts. Perpetua's proposed conditional restriction (Perpetua, 2022) specifies that net diversions "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." This proposed restriction does not include the additional groundwater diversion requests of 0.46 cfs (from request nos. 85399, 77-14377, and 77-14379) for potable use at the SGP.

For purposes of Perpetua's proposed condition, it has stated that (Perpetua, 2022):

1. Percent depletion is equal to net diversion divided by unimpaired streamflow.
2. Net diversion is the sum of groundwater and EFSFSR diversions (excluding groundwater diversions for potable use) 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[2]), plus the net diversion from EFSFSR and groundwater under water rights 77-7122, 77-7285, 77-7293, and 77-14378 (which excludes groundwater diversions for potable use).
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).

It should be noted that Perpetua did not model operational conditions should its water diversions be modified due to a 20 percent impact limitation (Perpetua, 2022). BAS believes it is possible that during times when unimpaired streamflow is less than 25 cfs, Perpetua could decide to divert additional groundwater designated for potable uses, thereby shifting the total impacts toward groundwater drawdown, which will also have an impact on stream flows. Impacts to groundwater and EFSFSR streamflow have not been quantified under this scenario (see Section III(B)(ii)).

[2] Please note that the USGS gage East Fork South Fork of the Salmon River Above Sugar Creek Near Stibnite, ID has gage number 13311250. Reference to USGS 1331250 (Scanlan and Stanaway, 2023) is assumed to be a typographical error.

There are three critical flaws associated with the definitions and calculations of net diversion and unimpaired streamflow that Perpetua used in its proposed water right condition:

i. Perpetua's proposed 20 percent impact limitation (Perpetua, 2022) excludes the permit requests for on-site potable use;
ii. Perpetua should not reduce the sum of groundwater and EFSFSR diversions by the volume of treated water discharged to the EFSFSR and its tributaries in the calculation of net diversions; and
iii. "Unimpaired streamflow" should not include flow in Sugar Creek (USGS 13311450).

It is incorrect to exclude the permit requests for on-site potable groundwater diversion (0.46 cfs) from the calculation of total net diversions. The net diversion calculation is meant to determine impacts from the SGP on EFSFSR stream flows and groundwater diversions for potable uses will cause impact to groundwater and streamflow, and, therefore, should be part of the calculation of total net diversions.

By calculating net diversion as the sum of groundwater and EFSFSR diversions minus discharge of treated water to the EFSFSR and its tributaries, Perpetua double-counts the benefits of discharging the treated water. Discharge of treated water within the SGP site, upstream of the USGS gage on the EFSFSR above Sugar Creek (USGS gage no. 13311250) is in effect double counting this water, because the treated water is then measured at the gage. In other words, this calculation allows Perpetua to reduce the volume of its water use by the amount it treats and discharges to the EFSFSR and its tributaries. However, this treated water will then flow downstream where it will be measured at USGS gage no. 13311250. Under this condition, Perpetua could divert additional water as long as it treats and returns more water, further disrupting the hydrologic cycle. Perpetua has erroneously and artificially reduced its impacts to EFSFSR streamflow by calculating diversions in this way.

Furthermore, adding Sugar Creek streamflow to the calculation of unimpaired streamflow increases the total streamflow and thereby artificially decreases the apparent impacts to the EFSFSR upgradient of the confluence with Sugar Creek. Perpetua shows on Figure 2-1 (Brown and Caldwell, 2021a) that there will be approximately a one-quarter mile distance between the end of the EFSFSR Tunnel and Fishway and the confluence of the EFSFSR with Sugar Creek. This stretch of the EFSFSR is part of designated Critical Habitat area for Steelhead (50 CFR 226.212(o)(15)(iv))[3] and Chinook salmon (50 CFR 226.205(b)).[4] Comparing groundwater and surface water diversions for the SGP to total stream flows downstream of where the EFSFSR is joined by Sugar Creek is illogical and artificially dilutes impacts to Critical Habitat area on the EFSFSR.

[3] Code of Federal Regulations Title 50, Chapter II, Subchapter C, Part 226.212.
[4] Code of Federal Regulations Title 50, Chapter II, Subchapter C, Part 226.205.

V. SUMMARY AND CONCLUSIONS

BAS has performed a technical assessment of Perpetua's *Expert Report – Water Right Application* (Scanlan and Stanaway, 2023) and associated water rights applications for permit (Perpetua, 2021), and has arrived at the following conclusions:

1. **Perpetua has not demonstrated that it will need its requested water right of 9.6 cfs, let alone 11.14 cfs to operate the SGP**. In fact, Perpetua has demonstrated that its average annual water needs will be about 2,272 af/yr, which is equivalent to a constant diversion rate of 3.2 cfs or one-third of its requested water right (no. 77-14378).

2. **Perpetua did not determine the impacts to EFSFSR streamflow from the diversion of 9.6 cfs with the SHSM**. At most, Perpetua modeled annual diversions of less than half the requested amount of water (4.4 cfs). Realistic impacts to EFSFSR streamflow from the diversion of 9.6 cfs of water cannot be determined from Perpetua's impact analysis because it did not model this diversion amount.

3. **Perpetua could, at any time, divert its full 9.6 cfs water right from streamflow or groundwater sources**. Unusual climatic conditions or operational conditions could cause a change in how and where Perpetua chooses to divert water. Perpetua did not model the scenario if it was to remove most or all of their water from one diversion source to determine impacts to groundwater and EFSFSR streamflow. Perpetua has therefore failed to demonstrate what the upper limit diversion from any one water source should be.

4. **Perpetua did not evaluate impacts from the diversion of runoff, a volume of water that it calls potentially significant**. Runoff water in the EFSFSR headwaters currently infiltrates to groundwater or flows to the EFSFSR or its tributaries. Capturing runoff at the SGP site will affect the hydrologic cycle in the EFSFSR headwaters and should be part of the impact analysis to understand how EFSFSR streamflow will be affected by SGP operations and how much surface and groundwater will be available for diversion.

5. **Perpetua double counted its release of treated water by reducing its calculation of water use by the amount of treated water released in its proposed condition (Perpetua, 2022)**. Treated water released by Perpetua into the EFSFSR or its tributaries will flow within the EFSFSR stream channel to USGS streamflow gage East Fork South Fork of the Salmon River Above Sugar Creek Near Stibnite, ID (13311250). Perpetua's proposed calculation of net diversions subtracts the amount of treated water released to the EFSFSR or its tributaries, thereby decreasing its total water diversions. However, treated water will be part of the stream flow measured at gage 13311250 and included in the calculation of unimpaired streamflow, in effect double counting the treated, released water.

6. **Perpetua artificially decreased its projected impacts to streamflow in the EFSFSR by comparing SGP water use to streamflow in Sugar Creek, rather than only to streamflow in EFSFSR above Sugar Creek, in its proposed condition (Perpetua, 2022)**. It is illogical to compare water use on the EFSFSR above Sugar Creek to total streamflow below Sugar Creek to provide an estimate of the relative percentage of impacts to the EFSFSR. Perpetua should compare its water use to EFSFSR stream flow above Sugar Creek to accurately evaluate the impacts of the SGP on stream flow.

VI. REFERENCES

Brown and Caldwell (2021a). *Final Hydrologic Site Model Refined Proposed Action (ModPRO2) Report*, Prepared for Perpetua Resources Idaho, Inc., Valley County, Idaho, August 2021

Brown and Caldwell (2021b). Technical Memorandum from Dan Stanaway (Brown and Caldwell) to Perpetua Resources, Dated October 8, 2021, Subject: SGP Water Right Diversion Rate and Storage Volumes, (*in Perpetua 2021*).

Scanlan and Stanaway (2023). Memorandum from Terry Scanlan (HDR Engineering) and Dan Stanaway (Brown and Caldwell), to Wade Foster (Stoel Rives), Dated Monday, September 11, 2023, Subject: Expert Report for Water Right Applications for Permit 65-24089, 77-14377, 77-14378, 77-14379, 77-14381, Applications for Transfers 85396 (77-7122), 85397 (77-7285), 85398 (77-7293), and 85399 (77-7141), and Application for Exchange 85538 (77-7293)

Perpetua Resources Idaho Inc (Perpetua), 2021. State of Idaho Department of Water Resources Application for Permit, and all associated application materials

Perpetua, 2022. Request for Technical Assistance Review – Perpetua Resources Idaho, Inc. Submitted to the Governor's Office of Energy and Mineral Resources, June 27, 2022.

SIGNATURES

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