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United States Forest Service, Payette National Forest
Attn: Linda Jackson, Payette Forest Supervisor
500 North Mission Street
McCall, ID 83638

Subject: Comments on the Stibnite Gold Project Supplemental Draft Environmental Impact Statement: Surface Water and Groundwater Quantity and Surface Water and Groundwater Quality

Dear Ms. Jackson,

Perpetua Resources Idaho, Inc., (Perpetua Resources) appreciates the opportunity to provide comments on the Supplemental Draft Environmental Impact Statement (SDEIS). The SDEIS is a well written and concise document. Perpetua Resources applauds the substantial effort by the multitude of individuals that contributed to the compilation of the very large volume of information and analysis regarding the Perpetua Resources proposed Stibnite Gold Project (SGP). The synthesis of hundreds of documents developed from a much greater multitude of data values, analyses and modeling projections into a single draft product is a noteworthy accomplishment. Perpetua Resources is pleased to have been a stakeholder in its development.

Perpetua Resources wishes to respectfully offer its perspective and insight to assist in clarifying and improving content for the Final Environmental Impact Statement (FEIS). This comment letter contains our suggestions on portions of the SDEIS discussing the surface water and groundwater in the affected area (Sections 3.8 and 3.9) and to the potential environmental consequences of the Project on surface water and groundwater quantity and quality (Sections 4.8 and 4.9), for your consideration in developing the FEIS. Our comments are summarized below, and for your convenience, comments have been provided in a tabulated format (included as Attachment A that references each appropriate subsection heading, page number and paragraph).

Primary comments on water *quantity* can be summarized into the following categories: calculation of percent difference in streamflow, groundwater drawdown, groundwater model calibration, groundwater model sensitivity, and water rights. Primary comments on water *quality* can be summarized into the following categories: mercury water quality standards, acknowledgement of benefits to water quality, interpretation of particle tracking and groundwater impacts downgradient of Yellow Pine pit, and conservative assumptions in the Site Wide Water Chemistry (SWWC) model.

1.0 Surface Water and Groundwater Quantity and Surface Water and Groundwater Quality

We found Sections 3.8 and 3.9 overall provide a reasonable characterization of water quality and quantity for existing water resource conditions at the SGP site. Sections 3.8 and 3.9 conveyed the existing environmental conditions accurately. The summary of baseline surface water and groundwater monitoring data from recent years, as well as, the vast information contained in agency reports and published technical papers yields an appropriate representation of the groundwater and surface water conditions at the SGP. Particularly, we appreciate the discussion of the extensive testing and knowledge of groundwater in Section 3.8. Comments on these two sections are in Attachment A.

2.0 Calculation of Percent Difference in Streamflow

The discussion in the Surface Water Quantity subsection of Section 4.8 beginning on page 4-163 and including Table 4.8-4 should be clarified. It is difficult to replicate the values from the cited source and values presented should be percent change, (i.e., (MMP – EC)/EC) and show the direction of change. Similarly, references to relative percent difference should be replaced with percent change and the title of Table 4.8-4 should be modified to describe the calculation performed, such as "Average Monthly Percent Change in Stream Flows during the Mine Operations Period". Additionally, please clarify if the row labeled "Maximum Monthly Reduction" in Table 4.8-4 is maximum reduction in cubic feet per second (cfs) or a maximum percent change. A minimum percent change and the durations and periods of such occurrences would be helpful to assess impacts. Lastly, please verify calculations to confirm values are correct and describe the calculation performed for transparency.

The description also reads as biased toward maximum negative impact without a description of duration, actual magnitude of change in flow rate, and minimum impact or positive impact. The percentages used can be misleading because there is a not a description of the actual change in flow. Please clarify this information with a presentation of the duration of maximum impact and add magnitude of change to the discussion.

3.0 Discussion of Groundwater Drawdown

The discussion in the Impacts to Groundwater Flow subsection of Section 4.8 describes groundwater level drawdown. Perpetua Resources largely agrees with the interpretation and discussion. A point of clarification in the discussion surrounds the depictions of groundwater drawdown associated with dewatering in the Hangar Flats and Yellow Pine pit areas where changes in existing topography are not considered. Not including discussion of this important change in topography may lead to interpretations that groundwater levels do not recover and remain depressed even at 100 years post-mining (SDEIS, Figure 4.8-9).

Groundwater level drawdown is calculated as the difference between groundwater elevations in the existing conditions and groundwater elevations measured or predicted at a future date. It is important to recognize that existing conditions groundwater elevations reflect levels of saturation in consolidated and unconsolidated materials. If those materials are removed by mining, groundwater elevations are necessarily lowered. This condition does not mean that groundwater levels in the post-mining period remain at a great depth below the post-mining surface topography. In fact, the depth to groundwater in locations where materials will be removed may be similar to depths below ground surface during existing conditions.

The inactive cells in Figure 4.8-9 are areas where proposed mining will remove geologic materials, lowering the topographic surface. Cells cannot be deleted from the model, but they can become inactive, and simulation of the groundwater surface is then characterized in the underlying active cells. The areas of greatest persistent drawdown generally coincide with these mined out areas, creating an easily misunderstood depiction of the state of recovery of the groundwater system post mining, whereas the trough-like areas of significant drawdown represent changes from the existing conditions groundwater levels without regard to changes in topography rather than depression of the post-mining water table. Thus, the general character of groundwater flow through the mining area is anticipated to be similar to existing conditions in the post-mining period. Perpetua Resources suggests that an interpretation of groundwater levels include a discussion of topographical changes and changes in depth to groundwater to further qualify the information presented.

4.0 Groundwater Dependent Ecosystems

The effects of dewatering on groundwater dependent ecosystems (GDEs) are discussed in the SDEIS in Section 4.9 and shown in Figure 4.8-10 as the presence of seeps and springs that are within the predicted extent of the 10-foot groundwater drawdown contour. While text on page 4-162 provides discussion on the uncertainties associated with the 10-foot drawdown contour, the visual depiction on Figure 4.8-10 and the legend to that figure do not capture those uncertainties, including that impacts to specific seeps or springs would depend on the degree of interconnection between the perennial surface water and the aquifer affected by mine-related pumping. It should also be noted that many of the GDEs depicted on Figure 4.8-10 are within the mine disturbance footprint and will be directly lost during construction and should not be double counted by including them with GDEs with a potential to be affected by dewatering and water supply pumping. Perpetua Resources suggests that the document should reiterate the uncertainty with the 10-foot contour, discuss interpretation of the 10-foot contour, and show only the seeps and springs that will physically exist after mining and reclamation.

5.0 Discussion of Groundwater Model Calibration

The discussion of the groundwater model setup and calibration would benefit from clarifying statements that are described in the bullets below.

- Paragraph 3 on page 4-151 omits that the groundwater model also predicts streamflow. While baseflow is described in the 4th bullet of the last sentence, this neglects to include runoff contributions to streamflow and the predictions of peak flows in the annual hydrograph. The suggested clarification to the sentence is "…4) streamflow from groundwater discharge and runoff."
- The idea of a steady-state calibration is inaccurate. The model was calibrated to transient groundwater level and streamflow calibration targets. Steady-state calibration is discussed in the last sentence of the fourth paragraph on page 4-154. Steady-state calibration should be struck.
- As well, the third paragraph on page 4-152 incorrectly states pre-mining steady state conditions and transient conditions associated with the pumping test. While the model was calibrated to the transient conditions of the pumping test, the model was also calibrated to the transient conditions

of groundwater level in the monitoring wells and streamflows. A suggested correction to the statement is, "Model calibration was accomplished using a process that included transient simulation of pre-mining conditions followed by localized calibration of transient response to pumping tests."

- The last sentence of the third paragraph on page 4-152 is mostly correct but would benefit from additional detail. The suggested revision is "…locations by varying input to the Meteoric Water Balance (MWB) including precipitation bias, deep percolation rate, and porosity coupled with variation in MODFLOW of horizontal hydraulic conductivity, specific yield and specific storage within ranges of measured values for each parameter in each of the modeled hydrologic units."
- Elements in addition to the partitioning of unconsolidated dominated areas and bedrock dominated areas are included in the MWB. The Lower East Fork of the South Fork of the Salmon River (EFSFSR), Upper EFSFSR, Meadow Creek, and Sugar Creek were calibrated for precipitation bias and temperature was adjusted based on elevation. The discussion of the components of the MWB in the last paragraph on page 4-151 continuing into the first paragraph on page 4-152 is incomplete with the omission of components. Perpetua Resources suggests that this additional detail is added for completeness.

6.0 Discussion of Groundwater Model Sensitivity

The discussion of groundwater model sensitivity would be significantly improved by simplifying clarifying misstatements and being directly applied to the Stibnite Hydrologic Site Model (SHSM). The following sections provide recommendations to make the groundwater model sensitivity discussion focused and to increase accuracy.

Some of the description in this section is inapplicable to the SHSM and it is suggested that the following be removed to avoid potential confusion:

- The second set of bulleted items on page 4-175 are not specific to the SHSM and don't add to the description of uncertainty relevant to the SDEIS.
- The first 2 paragraphs on page 4-176 are not relevant to the SHSM. An approach is discussed of altering a model through a sensitivity analysis process and recalibrating prior to use for predictive purposes. The SHSM used for predictions during and following mine operations was not altered by the sensitivity analysis. These two paragraphs should be deleted to avoid potential confusion around the use of the SHSM and the role of the sensitivity analysis that was performed.
- Similarly, the third paragraph on page 4-176 points out that while there are other approaches to uncertainty evaluation, they are not typical nor practical for model applications such as the SHSM. Since these alternative methods were not used for evaluating uncertainty in the SHSM this discussion seems out of place and not relevant to the discussion of uncertainty specific to the SHSM and should be deleted to avoid confusion.

The next paragraph (paragraph 4 on page 4-176) includes an assertion that "Parameter value selection for the hydraulic characteristics simulated in the SGP hydrologic model is the primary source of uncertainty…" for the SHSM. A reference that supports this conclusion is not included and this was not a conclusion of the SHSM calibration report (Brown and Caldwell [BC] 2021e) or sensitivity analysis report

(BC 2021h). The SHSM sensitivity analysis has a contrasting conclusion and demonstrates the model is not sensitive to bedrock hydraulic conductivity or specific yield. Many of the scenarios tested using substantially higher bedrock hydraulic conductivity resulted in a poorly calibrated model. A reference supporting the conclusion in the SDEIS should be included or the statement revised to accurately represent the technical papers cited in this comment.

The final conclusion in paragraph 4 on page 4-176 is that the "…bedrock aquifer hydraulic characteristics are important because bedrock-hosted groundwater is extensively present throughout the Analysis Area". This statement is not referenced and is not supported by the Hydrologic Conceptual Site Model (HCSM), or the results of aquifer testing provided in the SHSM model report (BC2021e) and the SGP Hydrogeologic Data Adequacy Review (BC 2021g). Specifically, the HCSM includes bedrock groundwater flow present, in any substantial quantity, in the transition zone only (SHSM layer 3) and the deeper bedrock zones are substantially less permeable and no significant groundwater is present (SHSM layers 4 and 5). The sensitivity analysis clearly demonstrates that increasing hydraulic conductivity in SHSM layers 4 and 5 results in a poorly calibrated model that would be unsuitable for use in evaluating mine impacts. Perpetua Resources recommends that this sentence be deleted.

Paragraph 6 introduces a comparison of pit dewatering without the context discussed in previous paragraphs establishing the poorly calibrated condition of the SHSM under the increased hydraulic conductivity conditions. To avoid misunderstanding the pit dewatering comparison the following text should be added, "This comparison of pit dewatering rates illustrates the conclusion that a very poorly calibrated model is required in order to generate pit dewatering rates that are substantially different from those estimated by the fully calibrated SHSM." The calibrated SHSM predictions for pit dewatering are therefore suitable for evaluating mine impacts because "… there are no substantially different combinations of input parameters that would result in a more closely calibrated model and thereby potentially change predictions of future mine impacts. (BC2021h)."

Paragraph 7 on page 4-176 that continues into first paragraph on page 4-177 and the second paragraph on page 4-177 speculate on potential impacts of simulations made using a model based on hydraulic parameters other than those in the fully calibrated SHSM. This discussion is potentially misleading because the predictions were made with a poorly calibrated model, and are, by definition, untested and include potentially unacceptable uncertainties. Because of the uncalibrated model condition of these sensitivity analysis scenarios, the dewatering comparisons and inferred impacts that form the basis of these paragraphs do not add to the understanding of uncertainty in the calibrated SHSM. These two paragraphs should be deleted.

7.0 Discussion of Water Rights

The description of water rights in section 4.8 is generally accurate but could benefit from some additional clarifications. We suggest that discussion surrounding the water rights application status, description of the application, description of the proposed mitigation plan, and the state and federal instream flow water rights could be provided in greater detail. As well, an explanation of the diversion rates cited would provide greater clarity. Suggested comments on each of these items is below.

The water right application status is described in the future tense with phrasing such as "Perpetua plans to apply" and "After a water right application has been filed". This tense is not current now and will not be current when the FEIS is published. The water right application was submitted to the Idaho Department of Water Resources (IDWR) in October 2021. Since that time, the application has been in review, posted for public comment and Perpetua Resources has been working to address issues raised during public comment. We suggest that the phrasing of the application submittal status be updated to accurately describe current status with wording such as "Perpetua submitted a water right application in October 2021…" and "IDWR is performing an analysis…".

The description of the Idaho Water Resource Board (IWRB) and federal minimum instream flow water rights would benefit from additional detail. It is not stated that Perpetua Resources' water right application is within the subordination clause of the water right since authorization is being sought for industrial beneficial use. Currently, it is difficult to understand how the IWRB and federal reserve water right would impact Perpetua Resources application. Further, paragraph 5 on page 4-174 states, "…and up to 8.2 cfs of new non-domestic, commercial, municipal, and industrial uses". This does not apply to Perpetua Resources; however, this is not stated. In the discussion of Water Right 77-14190 and minimum steam flow on the South Fork of the Salmon River (SFSR), the description could be improved by stating, "Instream rights on the SFSR and the EFSFSR are subordinate to all future domestic, commercial, municipal, and industrial (DCMI) uses. There is additional allowance for non-DCMI uses; however, this does not apply to Perpetua Resources because the water right application seeks industrial beneficial use. Perpetua Resources water right applications are within the allowance of the IWRB instream rights." Additionally, the IWRB Water Right 77-14174 is not identified by water right number in the discussion of the SFSR minimum flow water right. Finally, domestic, commercial, municipal, and industrial uses are commonly referred to as DCMI and we suggest using this more recognizable wording.

Similarly, the discussion of the Federal Reserve Water Rights for the Salmon Wild and Scenic River (WSR; 75-13316 and 77-11941) would improve with additional detail of the water right and discussion of how this could impact Perpetua Resources. The Federal Reserve water rights are subordinate to up to 150 cfs of new diversions; however, diversion to storage is explicitly not subordinated. Perpetua Resources water right application is within the diversion allowance of the water right and Perpetua Resources proposed diversion is not junior to the Federal Reserve water rights. However, diversion to storage is a junior use to the Federal Reserve water rights.

The first paragraph on page 4-175 introduces water right mitigation measures that will be determined by IDWR. This is correct; however, the discussion does not specify conditions when mitigation would be required, does not state that Perpetua Resources has submitted a proposed mitigation plan, and does not describe the proposed mitigation. Mitigation is anticipated to be required only when Perpetua Resources is diverting to storage and the minimum instream flow in the Federal Reserve Water Rights for the Salmon WSR (75-13316 and 77-11941) are not being met. This condition is expected to be a limited occurrence because diversion to storage is modeled to be required only during initial fill of the tailings storage facility (TSF). Perpetua Resources' proposed mitigation plan is to mitigate diversion to storage by non-use of irrigation water rights on the Salmon River and Morgan Creek that authorize diversion of up to 10.75 cfs. The proposed mitigation plan over mitigates 1) annual diversion volume to storage, 2) length of affected WSR stream length and, 3) duration. Perpetua Resources suggests that describing the proposed mitigation, benefits, and conditions when mitigation is required will make this discussion more complete.

With the submittal of Perpetua Resources' application, the description of the water right can include elements of the water right application. Important elements to include, in addition to the diversion rate, is the diversion to storage rate (9.6 cfs), the annual storage volume (600 acre-feet), and the beneficial use (industrial). These elements are critical to understand how the water right interacts with the minimum instream flow water rights.

Finally, the discussion cites diversion rates that are different from the diversion rate seeking authorization of 9.6 cfs. Diversion rates of 4 cfs, 4.05 cfs, and 9.68 cfs are used in the text as,

- "Typical rates of surface water diversion during the build-up of project water inventory would be approximately 4 cfs"
- "The maximum diversion rate under existing and proposed surface water rights is 4.05 cfs…"
- "…maximum diversions proposed by Perpetua from all sources and uses would be 9.68 cfs…"

It is not transparent how these diversion rates were estimated and how the values were applied. A discussion of the 4 cfs and 4.05 cfs and how these apply to the 9.6 cfs sought in the water right application would help clarify the first two bullets. The 9.68 cfs could be a typo because the total authorized water diversion for industrial and mining purposes with existing and proposed water rights is 9.86 cfs. We suggest that the generation of the values be described and why these are different from the diversion rate in the water right application or use the diversion rate in the water right application and existing water rights for clarity.

8.0 Mercury Water Quality Standards

In the Ore Stockpiles sub-section of Section 4.9.2.2 on page 4-190 in paragraph four there is reference to a non-regulatory water quality value calculated by the United States Environmental Protection Agency (EPA), "Other metal leaching concentrations were predicted to be below surface water standards with mercury concentrations between 7 nanograms per liter (ng/L) and 11 ng/L (SRK Consulting, Inc. [SRK] 2021a, Appendix A), but above the 2 ng/L concentration calculated by the EPA". The meaning of the final phrase of this statement is not clear, but Perpetua Resources is not aware of any "calculation" of a 2 ng/L concentration criteria by EPA. Idaho's approved Water Quality Standards (WQS) include a fish tissue methylmercury criterion (0.3 milligrams per kilogram) for the protection of Human Health, which Idaho asserts is also protective of aquatic life.

The WQS also indicate that, for Clean Water Act purposes, the 12 ng/L total recoverable mercury value from the 2004 Idaho Administrative Procedures Act regulations continues to apply. The Implementation Guidance for the Idaho Mercury Water Quality Criteria published by the Idaho Department of Environmental Quality in 2005 notes a value of 2 ng/L total mercury as the most stringent extreme in a sensitivity analysis to evaluate its methylmercury criteria, and then points to how overly protective such a value would be. Comments from EPA on documents prepared by Perpetua Resources suggested using a 2 ng/L value, but that value is not an adopted or approved water quality criterion. Perpetua Resources notes that National Pollutant Discharge Elimination System permits recently written by EPA for mines in Idaho contain daily discharge limits such as 26 ng/L (US Silver Coeur and Galena Mine – 2019), 53 ng/L and 57 ng/L (Hecla Grouse Creek Mine – 2018), and 40 ng/L, 99 ng/L, and 130 ng/L (Hecla Lucky Friday Mine - 2019), all of which are well above the concentrations predicted for the SGP. Based on the promulgated standard and this additional information, predicted mercury values should only be compared to the applicable standard (i.e., 12 ng/L) and the reference to 2 ng/L should be removed.

9.0 Acknowledgement of Benefits to Water Quality

There are multiple occurrences of the SDEIS not acknowledging the positive impacts to water quality that will be realized because of the Project. Section 4.9 appears to be biased without full disclosure of these benefits. There is language in the section that describes significant improvements in water quality as "similar to existing conditions" where, in reality, modeling suggests that improvements can be as much 30 percent to 40 percent or more. The qualification of these benefits as similar to existing conditions understates anticipated improvements. Additionally, there is at least one instance where order of magnitude improvements are not recognized or discussed. Overlooking positive impacts and downplaying the magnitude of improvement renders Section 4.9 not a fully representative effects analysis and demonstrates a bias in the discussion. These occurrences are easily remedied, and Perpetua Resources has commented on these in the comment table with additional detail in the bullets below.

- In Section 4.9.2.2 on page 4-190 there is discussion of runoff chemistry and toe seepage that are predicted to be above the strictest water quality standard. There is, however, no discussion of improvements to groundwater. It should be stated that the groundwater quality predicted below the TSF Buttress is significantly improved compared to the current conditions as a result of removing the Hecla Heap and spent ore disposal area (SODA)/Bradley tailings. Groundwater arsenic and antimony concentrations are predicted to be an order of magnitude lower than the current conditions as a result of the mine plan. Furthermore, there is a significant reduction in infiltration from the TSF Buttress during the post-closure period as a result of placement of a geosynthetic cover and infiltration is reduced to near zero. The following text should be added to provide a full account of the predicted changes to groundwater in the Hangar Flats area: "Upon placement of the geosynthetic cover on the TSF Buttress, infiltration is significantly reduced and arsenic and antimony concentrations in groundwater decrease but remain elevated above groundwater standards due to the recharge of residual water within the TSF Embankment and Buttress. However, the predicted arsenic and antimony concentrations in groundwater during the post-closure period are significantly lower than the existing conditions due to the removal of legacy facilities (Hecla Heap and SODA/Bradley tailings) during mining. Based on average concentrations from MWH-A04, arsenic and antimony in groundwater are 1.8 and 0.06 milligrams per liter respectively under existing conditions. Arsenic and antimony concentrations are predicted to be an order of magnitude lower for the post-closure period due to the removal of the legacy facilities but still elevated above the groundwater standards and background groundwater quality as defined by MWH-A01."
- In Section 4.9.2.2 on page 4-243, the discussion of groundwater chemistry is focused on potential negative impacts without mention of the significant improvement in groundwater quality in the Meadow Creek valley resulting from the removal of legacy material early in the mine life and pumping of contaminated groundwater in the dewatering process that is replaced with clean, unimpacted water into the currently contaminated area. The improvement of groundwater quality in the Hangar Flats area resulting from the removal of legacy facilities is not clearly captured in

discussion of groundwater impacts. The following is a suggested replacement of the second paragraph on Page 4-243: "Effects of the 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 negligible changes to groundwater parameter concentrations under the TSF and no constituents exceed groundwater quality standards. Infiltration from the unlined TSF Buttress is predicted to result in an increase in groundwater analyte concentrations. Specifically, mixing of infiltrated leachate with alluvial groundwater is predicted to result in antimony and arsenic groundwater concentrations greater than unimpacted groundwater and both constituents are predicted to be above groundwater standards. Both arsenic and antimony concentrations decrease in groundwater after placement of the geosynthetic liner but remain above the groundwater standards. However, post closure arsenic and antimony concentration are predicted to be an order of magnitude lower in comparison to existing groundwater conditions due the removal of legacy facilities (e.g., Hecla Heap and SODA/Bradley tailings), representing an overall net improvement to groundwater quality as a result of mining activities."

- In Section 4.9.2.2 on page 4-248, the benefits to surface water chemistry during operations and the post closure period are minimized and incorrectly quantified. The water quality improvement with reductions in arsenic and antimony at YP-SR-4 should be quantified. Reductions are as much as 40 percent in the post closure period and greater during operations. The statement that, "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)" does not accurately portray the modeling results.
- In Section 4.9.2.2 on page 4-251, the statement regarding surface water quality predictions for YP-SR-2, "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", is misleading. The results show arsenic and antimony at YP-SR-2 during post-closure conditions are significantly lower (30 percent to 40 percent) relative to existing conditions. This positive impact should be clearly stated and quantified.
- In Section 4.9.2.2 on page 4-252, the SDEIS states that the "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". However, it should also be acknowledged that there is a substantial improvement in surface water quality compared to existing conditions because of this project. The Project's positive impact is downplayed in this discussion.

10.0 Interpretation of Particle Tracking and Groundwater Impacts Downgradient of Yellow Pine Pit

The particle tracking results are not applied correctly in the discussion in Section 4.9.2.2 on page 4-244. Particle tracking does not account for changes in chemical mass in groundwater that naturally occur as the result of chemical interactions with minerals in the ground and dispersion of chemical mass as groundwater moves through the ground. Therefore, even though 2 percent of the particles were estimated to originate from the backfill, this does not automatically relate to groundwater concentrations, nor does it speak to the potential for the pore water to degrade groundwater. The potential to degrade groundwater depends upon the existing groundwater chemistry and how different it is from the pore water leaving the backfilled pit. In the case where the existing groundwater is already impacted and concentrations are higher than in the pore water, there could actually be an improvement in existing groundwater conditions. This potential to improve previously impacted groundwater downgradient of the YPP needs to be acknowledged.

Furthermore, the conclusion that some areas would see major negative effects is premised on the assumption that these areas are not already impacted by legacy mining materials and in-situ mineralized rock. The cited wells (i.e., MWH-A17 and SRK-GM-04S) are only drilled to about 100 feet and are screened at elevations of 6100 feet and 6040 feet respectively; approximately the same elevation as the existing pit lake (6040 feet) and elevation of future backfill. These screen elevations may not be sufficiently deep to adequately assess existing water quality of the receiving alluvial or bedrock aquifer where it could be impacted by pit backfill materials or pit wall contact. It is expected that water quality in the bedrock aquifer and alluvial aquifer downgradient of the Yellow Pine pit ore body and at depths below shallow wells, is already impacted by spatially extensive mineralization and alteration in the area as well as legacy facilities.

11.0 Conservative Assumptions in the Site-Wide Water Chemistry Model

Similar to Item 9, the discussion surrounding model sensitivity and uncertainty in Section 4.9.2.4 on pages 4-279 and 4-280 presents uncertainties and potentially non-conservative assumptions. This may lead to a biased review of the model because conservative assumptions used in the model are not sufficiently presented. Presenting only non-conservative assumptions without discussion of conservative assumptions or further qualifying the non-conservative assumptions leads to a misunderstanding that predictions made by the SWWC model underpredict negative impacts and overpredict positive impacts. This is not the case. Many conservative assumptions were used during model development and use. The bullets on page 4-279 and page 4-280 should be further clarified with the caveats noted below for a fair and balanced discussion.

- "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, far longer than industry-standard Humidity Cell Test durations), 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." [Caveat: However, site data show that acid generation has not occurred from historical mine waste despite exposure at surface for several decades. Circum-neutral to moderately alkaline baseline surface water and groundwater chemistry (and pit lake chemistry) also supports the assumption there has been no/limited acid generation from historical mine wastes.]
- "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." [Caveat: However, it could be argued that the first flush chemistry will occur during operations, the majority of which will be managed as contact water and treated, therefore this will have minimal effect on in-stream concentrations. Furthermore, steady state chemistry is typically considered more representative for use in geochemical predictions (Maest and Kuipers, 2005; Price 1997). The initial flushing in humidity cells mobilizes oxidation products that formed prior to initiation of the test (i.e., they represent an accumulation of load derived at steady-state rates). This process represents a flushing effect in the lab but direct application of the humidity cell "first-flush" in the modeling is challenging since the load accumulation timeframe will be different in the field. Flushing effects can be accounted for using steady-state rates through accumulation of load during each time step. For example, the length of the timesteps of a pit lake model can vary from 1 year to 25 years. Flow always exists; however, the flushing load is inherently accounted for by releasing all load generated in each timestep in the estimated pit wall runoff volume.]

- "Air temperature from the site was used to scale laboratory reaction rates to field conditions and could underestimate actual reaction rates and chemical releases from mined materials, and hence, surface water quality impacts." [Caveat: However, during colder months of the year, actual reaction rates and chemical releases from mined materials could be overpredicted. The most practical approach is to use the average temperature value and recognize there is a potential for constituents to be seasonally higher or lower than predicted. Based on the sensitivity analysis, concentrations are higher for the higher temperature scenario; however, the difference is not significant enough to change the overall conclusions.]
- "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." [Caveat: However, surface water runoff will be managed during operations and a geosynthetic cover would be placed on the facilities at closure and overlain by an inert soil/rock layer and growth media and revegetated. These controls will limit the potential for particulates to contribute to constituent load in the surface water system.]

Thank you for considering Perpetua Resources' comments. Please contact me if you any questions.

Sincerely,

Alan Haslam
PERPETUA RESOURCES IDAHO, INC.
Vice President – Permitting
Enclosure:
Attachment A