Pebble EIS Draft Hydrogeology Sections
EPA Comments
12/21/18

The EPA appreciates the opportunity, as a cooperating agency, to provide you with these comments on the preliminary draft Hydrogeology Sections 3.17, K3.17 and 4.17 (November 2018 review draft) of the Pebble EIS. Our comments are provided in table format below. Our public comments on the Draft EIS may include additional concerns or recommendations. These interagency comments or portions thereof may be protected by the deliberative process privilege.

Page	**Section**	**Existing text (if applicable)**	**Recommendation**
General	3.17	Baseline hydrogeology for alternatives	This section focusses on baseline hydrogeology for the proposed action (Alternative 1). We recommend that this section of the DEIS also discuss baseline hydrogeology for alternatives 2 and 3 including the north road and alternative port site. If hydrogeologic information is not available for alternatives, then please describe if and when it will be collected and when it will be included in the EIS. If additional data is not being collected, then please describe how this affects the impact analysis in Section 4.17.
3.17-1	3.17.1.1	Hydrogeological Characterization Programs	This section references the hydrogeologic characterization data collection activities. Per previous comments submitted to the Corps on 7/5/2018, we recommend that the EIS describe the adequacy of the hydrogeologic characterization data collection and assessment, whether there are any data gaps, and how the data gaps might affect the impact assessment.
3.17-1	3.17.1 Mine Site	This section describes existing hydrogeologic conditions in the mine site area (Figure 3.17-1) that are anticipated to be the most affected by project activities. For example, dewatering associated with the open pit would create a zone of influence around the area of the open pit where groundwater levels and groundwater quantity, groundwater/surface water interactions, and surface water flows	We recommend summarizing the hydrogeologic condition changes expected to occur in the mine site that provide the basis for determining the area “most affected by project activities.” We recommend referencing figures where appropriate. In addition, as requested in our previous comments submitted to the Corps on 7/5/2018, we continue to

		would be affected. Other influences on groundwater and surface water levels and flow may include groundwater seepage and flow pathways away from the tailings storage facility (TSF) and water management ponds.	recommend that the EIS disclose the official classifications of underlying aquifers (designated by the state) including identifying all underground sources of drinking water, as well as disclose the locations/distance of the nearest drinking water protection areas/drinking water wells/surface water intakes.
3.17-4	Figure 3.17-2 Monitoring Well, Piezometer, and Seep locations		We recommend providing additional information in Figure 3.17-2, which contains a large number of data points without identifications. At a minimum, we recommend that monitoring well ID #s, cross-section line designations, and stream gaging station ID#s should be included, especially near the relevant Mine Site features and/or locations used for baseline establishment and future compliance monitoring. We also recommend including a note on the Figure referencing where additional details (i.e., summary tables) can be found.
3.17-6	3.17.1.2 Hydrostratigraphic Units	Shallow groundwater flow patterns in the overburden at seasonal low levels are illustrated in Figure 3.17-9.	We recommend providing additional Figures representing shallow groundwater flow patterns that indicate seasonal variability, or consistency, as appropriate.
3.17-8 thru 3.17-11	Section 3.17.1.3 and Figures 3.17-5 thru 3.17-8 Geologic Cross Sections	Many of the faults act as flow barriers, while others appear as flow conduits resulting in compartmentalized groundwater flow with the bedrock at depth. The compartments limit regional groundwater flow within the deep bedrock.	We recommend indicating where seeps are known to exist and other surface water/groundwater interface locations, as well as where faults act as flow barriers and where they facilitate “compartmentalized” groundwater flow may exist.
3.17-13	3.17.1.3 Hydrogeology Overview	Groundwater gradients in the vicinity of the Pebble deposit are vertically upward with a minimal horizontal component, indicating that groundwater in the vicinity of the deposit locally discharges to the upper reaches of the SFK River, and is unlikely to flow across groundwater divides or migrate appreciable distances down the valley before discharging to surface water.	We recommend referencing where data indicate upward vertical gradients and illustrating this information in figures.

3.17-27 and 3.17-30	3..17.1.6 Site-Wide Water Balance Model and 3.17.1.7 Mine Site Groundwater Flow Model	Site-wide water balance model, mine site groundwater flow models (Schlumberger and Piteau).	Per our scoping comments and additional comments submitted to the Corps on 7/5/2018, we continue to recommend that the EIS discuss the adequacy and accuracy of the models used to characterize baseline conditions and assess impacts. Appendix K3.17 discusses model calibration but does not describe why the specific models were selected for use or disclose any limitations and uncertainties associated with the model input parameters, assumptions, and outcomes. For example, there is no information provided that describes the accuracy of the estimates of groundwater flow changes, drawdown, and seepage. This information is needed to disclose the certainty associated with the impact assessment predictions and inform mitigation needs. We recommend that this information be added to the appendices (Appendix K3.17 or possibly create a new appendix, K4.17). As examples, see Section 4.3 of the Haile Gold Mine Final EIS (USACE, Charleston District, July 2014) and the Donlin Gold Final EIS (USACE, Alaska District, April 2018) which provide summaries of the basis, evaluation, approach, and sensitivity analysis of all models used.
3-17-31	3.17	Groundwater and surface water interaction was characterized based on detailed streamflow surveys and the site-wide WBM. Figure 3.16-4 (see Section 3.16, Surface Water Hydrogeology) depicts stream gage locations.	We recommend that the DEIS include additional discussion of groundwater/surface water interaction across the mine site study area, including areas of potential dewatering impact. For example, we recommend describing, and indicating on figures, information collected from monitoring wells, seeps, and surface water staff gages, which can be used to measure such interactions. We note that Figure 3.16-4 shows the gaging stations within the area, but has no information related to the

			interactions, and recommend adding this information here or in another Figure.
4.17-1	4.17.1	In summary, there would be no direct or indirect impacts on baseline groundwater conditions from implementation of the No Action Alternative.	Since the no action alternative includes ongoing exploration, please describe the impacts that exploration has had on groundwater.
4.17-1	4.17.2.1	Groundwater modeling (Piteau 2018a).	The outcome of model predictions are provided in this section. As requested in comments previously submitted to the Corps and in the comment on section 3.17 above, we continue to recommend that model uncertainties and sensitivities be disclosed so that the level of uncertainty associated with model predictions are understood.
4.17-2	4.17.2-1	Although a specific dewatering design has not been developed at this point, the ultimate pit dewatering design would be based on a series of interim pit phases that successively expand and deepen the pit.	We recommend that the DEIS disclose how dewatering impacts were predicted absent a specific dewatering design.
4.17-2 to 4.17-3	4.17.2-1	The primary impact to groundwater flow would be in the alluvial, glacial, and bedrock aquifers in the open pit footprint and cone of depression. Groundwater flow in these aquifers would radially flow towards the pit, and be captured by the dewatering system. The groundwater impact would grow as mining proceeds to depth, and the cone of depression surrounding the pit becomes wider and extends to depth. Piteau Associates (2018a) estimates that the cone of depression at the end of mining would extend approximately 2,500 to 10,000 feet from the crest of the open pit, depending on the hydraulic character of the affected aquifers.	We recommend that the DEIS include figures that clearly show the predicted depth and extent of groundwater impacts. Specifically, we recommend figures that show: (1) the simulated maximum groundwater drawdown associated with the open pit dewatering cone of depression during mining; (2) the aerial and depth extent of the permanent groundwater sink and post-closure cone of depression; and (3) the change in areal and depth extent of groundwater changes due to the TSF. As examples, please see the Donlin EIS (Figures 3.6-8 through 3.6-10) and the Haile EIS (see Figures 4.3-9 to 4.3-14).
4.17-3	4.17.2.1 Pit Dewatering	The presence of a permanent groundwater sink at the pit would continue to locally influence groundwater flow in the immediate vicinity of the pit; however, the influence on groundwater flow would	We recommend providing a summary of how the “permanent sink” will be maintained and monitored into perpetuity or reference other sections of the EIS where this information is provided.

		be relatively small compared to active mining operations. Piteau Associates (2018a) estimates that the post-closure cone of depression would extend 2,000 to 4,000 feet or less during post-closure	
4.17-4	4.17.2.1 Water Management Ponds	The WMPs are expected to have no adverse impact on groundwater quality, because they would be lined to prevent leakage of impacted water to the subsurface.	Per our previous comments submitted to the Corps on 8/15/2018, we continue to recommend providing a description of the liner that would be used for the WMPs, a summary of how the lined ponds will be monitored to assure no leakage, and a description of the contingency plans that would be implemented should leaks be detected. In addition, we recommend disclosing how the assertion that leakage would be prevented comports with the one liter/second leakage rate assumed in Piteau 2018.
4.17-4	4.17.2.1 Water Management Ponds	The WMPs may help restore downgradient groundwater flow to maintain existing flow conditions as surplus water is treated and discharged downstream of the mine site.	Per our previous comments submitted to the Corps on 8/15/2018, we continue to recommend describing the magnitude and extent to which the treated water discharges would result in changes to groundwater flow.
4.17-4	4.17.2.1 Bulk TSF	Construction of the bulk TSF would locally impact surface water features at the site, and potentially impact groundwater/surface water interactions; this impact is expected to be small in extent (e.g., near the vicinity of the bulk TSF), but permanent.	We recommend providing a summary of how groundwater will be permanently impacted by discussing the estimated extent as well as providing a figure that shows the extent of the groundwater impacts.
4.17-4	4.17.2.1 Bulk TSF	Tailings seepage that is not captured could create a local groundwater mound beneath the TSF that could have a local influence on groundwater flow.	We recommend providing a reference to the section of the EIS that describes the TSF seepage collection system. In addition, based on the seepage collection system design, we recommend that the EIS provide an estimate of the amount of seepage that would not be captured by the system and describe the extent to which the seepage would influence groundwater flow (e.g., describe what is meant by “local”).
4.17-6	4.17.2.4 Natural	Potential contamination of shallow	We recommend referencing a Spill

	Pipeline Corridor – Shallow Groundwater Interception	groundwater and surface water could occur during pipeline construction from inadvertent spills of fuel and fluids from heavy machinery and trenching equipment operating in close proximity to the water table.	Prevention Control Plan and including a draft plan in the DEIS.
4.17-8	4.17.5 Table 4.17-1	Diverted groundwater would be largely captured, treated, and discharged to the affected drainages during construction and operations to restore natural flow conditions.	Section 4.17.2.1 does not currently describe how natural groundwater flow conditions would be restored. We recommend that the DEIS include the information that supports this conclusion.
4.17-9		Groundwater use would be highest during construction and operations, and is expected to largely recover to pre-mining levels once mining ends and reclamation occurs, except for the Bulk TSF and open pit	As discussed in the comments above, we recommend that the DEIS include figures that show areal and depth extent of groundwater changes during mining and at long-term post-closure.
4.17-11	4.17.6.1	Cumulative effects Overall, the incremental contribution of Alternative 1, and impact to groundwater from the project and the past, present, and reasonably foreseeable future actions (RFFAs), would be localized high-intensity changes in the vicinity of the mine site during the life of the project, because the effects of the project on groundwater are limited to a relatively small area, and would be reduced in post-closure as the site is reclaimed and groundwater returns to pre-mining conditions in all areas except the bulk TSF and the open pit where groundwater impacts would remain.	We recommend that additional information be provided to fully disclose cumulative impacts to groundwater hydrology associated with the Pebble project buildout. The conclusion in the cited text is not supported by any analysis. We recommend providing a discussion of the areal extent and depth of hydrogeological changes during mining and at closure associated with open pit dewatering, waste rock storage, TSF seepage, diversions, and discharges. We recommend that figures be provided to support the discussion of cumulative impacts and show the extent of impacts. In addition, if terms like “localized” and “high intensity” are being used, we recommend that they either be defined or replaced with estimates of the geographic extent and magnitude. For example, modeling may be needed to better characterize cumulative impacts of the Pebble project buildout.