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Agency	Comment Number	Section, Paragraph, and Page #	Relevant Text/Subject	Comment	Response
NPS	1	Section 4.24.2.1	Table 4.24-1: Miles of Stream Channel Impacted Due to Fill, Excavation, Inundation, or Blockage to Upstream Migrant Fishes and Resident Fishes	NPS requests that this section include citations to peer-reviewed information support these statements and the data in this table. Over the life of the project what will be the loss in salmon and resident fish production to potential subsistence users downstream?	Table 4.24-1 referenced in comment was replaced with descriptive text for clarity. *The duration of direct impacts of the removal of anadromous habitat would be permanent. However, considering the low use of habitat to be removed (based on densities of juvenile Chinook and coho captured within these habitats), and the few numbers of coho spawning in these reaches, measurable impacts to populations of salmon from these direct habitat losses would be unlikely.*
NPS	2	Section 4.24.2.1	Table 4.24-1, Fishless	Please provide a reference or proof to support the claim that these reaches are fishless.	Table 4.24-1 referenced in comment was replaced with descriptive text for clarity.
NPS	3	Section 4.24.2.1	When compared to the total mileage of currently documented anadromous waters in the three tributaries	Does this include the mainstem plus tributaries that feed into each mainstem or just the mainstem? Please provide your methodology or exactly where the scientific reference is located.	All stream lengths are GIS calculations based on the linear features provided in the 2018 ADF&G anadromous waters catalog.
NPS	4	Section 4.24.2.1	...the loss of Tributary 1.19 habitat represents 4 percent and 3 percent of spawning and rearing habitat for coho salmon,	Please provide the citation to support this statement.	All stream lengths are GIS calculations based on the linear features provided in the 2018 ADF&G anadromous waters catalog.

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			respectively; and 3 percent of Chinook salmon rearing habitat.		
NPS	5	Section 4.24.2.1	...with its 9,816 miles of currently documented anadromous waters, the loss of Tributary 1.19 represents a 0.002 percent reduction in miles of anadromous stream habitat, or a 0.03 percent decrease in accessible drainage area.	Using a linear measure to compare the loss of Trib 1.19 (and potentially the NFK, Mulchatna, Nushagak... should there be a failure), is not defensible since productivity among all the different salmon habitat types of Bristol Bay varies drastically. This section should identify volume of the spawning area, or at least area, and the fact that different species have specific habitat preferences. Since 80% of the region is actually headwaters, and coho use much of that to spawn in but these are generally not as large an area or as productive as rivers such as North Fork, South Fork and Upper Talarik. This linear measure is deceptive and misleading relative to what is really important salmon habitat.	All stream lengths are GIS calculations based on the linear features provided in the 2018 ADF&G anadromous waters catalog. Text revised in DEIS Section 4.24: *Adult coho salmon have been documented in 4.3 miles of Tributary 1.190, although only during one aerial survey, and in low numbers (27 fish) compared to other NFK tributaries (1,746 fish) (Owl Ridge et al. 2019). Spawning has not been documented in Tributary 1.190 for any other salmon species. The majority of adult fish and spawning observations for all adult salmon occurred downstream of waters that would be directly affected by mine facilities. Within the NFK River, the majority of salmon adults and spawners were observed in the lower portions of the rivers (R2 et al. 2011), suggesting the presence of higher-quality habitat, or simply adequate quantities of suitable habitat are readily available to accommodate the numbers of salmon entering the streams without the need to distribute further upstream.*
NPS	6	Section	Approximately 2.3	It is difficult to determine, based on Fig.	Text in Section 4.24 in the DEIS was

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		4.24.2.1	miles of Tributary 1.19 mainstem and sub-tributary stream channels would remain free-flowing. This habitat would not be accessible to anadromous fish due to blockage by downstream dams, but may continue to provide spawning and rearing habitat for resident species. In addition to the remaining free-flowing channels, approximately 1.4 miles of stream channel would be converted to reservoir habitat .	4.24.01, what all the acronyms mean and which species are going to be impacted where. Please define acronyms on the figure and which species will be impacted where.	revised for clarity: *Approximately 2.3 miles of Tributary 1.190 mainstem and sub tributary stream channels would remain free-flowing between the TSF and the water seepage pond. This habitat would not be accessible to anadromous fish due to blockage by the downstream seepage collection pond dam, but may continue to provide spawning and rearing habitat for resident species. In addition to the remaining free-flowing channels, approximately 1.4 miles of stream channel would be converted to reservoir habitat (seepage collection pond).*
NPS	7	Section 4.24.2.1	Surface water BMPs would be implemented during construction, operations, and closure; and changes in riparian wetlands would likely not be	Again, during spring and fall floods, the NFK and UTC can join together into one big wetland and mixing will occur.	References and citations for review and analysis will be considered in the EIS if provided.

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			detectable downstream from the mine site.		
NPS	8	Section 4.24.2.1	The affected stream channels are not classified as anadromous, but provide habitat for populations of resident fish,	The State Anadromous Waters Catalog seems to indicate that the Mine Site Layout in Fig. 2-3 will impact subsistence salmon habitat documented in the Upper SF Koktuli. It also indicates that a waste tailings pond pipe will be discharging into a documented anadromous salmon stream that feeds into Upper Talarik Creek. NPS recommends that the preferred alternative be changed to prevent discharge into Upper Talarik Creek. Mine impacts should be retained as much as possible in a single watershed. This section should analyze the exact discharge and analyze whether it will pose a threat to subsistence users of fish and or water. Please provide citation or page reference.	Text in Section 4.24 in the DEIS was revised for clarity: *In terms of magnitude, extent, and duration, the open pit and related mine facilities are expected to directly and permanently impact approximately 2.0 miles of fish habitat in the upper mainstem SFK and a tributary of SFK 1.190. …The other affected stream channels are not classified as anadromous, but provide habitat for populations of resident fish, including sculpin, Arctic grayling, and stickleback.* There are no "waste tailings pond pipes" in the proposed action. Water collection, treatment and discharge are described in Sections 4.16, Surface Water Hydrology, and 4.18, Water and Sediment Quality, of the DEIS.
NPS	9	Section 4.24.21	(Buell 1991).	Recommend referencing the State Anadromous Waters Catalog and their Freshwater Fish Inventory Database which is much more contemporary than this citation. Dolly Varden and other species have been documented in this region recently, please check ADFG and update information.	This reference and citation mentioned has been deleted in the DEIS.

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NPS	10	Section 4.24.21	No aquatic habitat would be directly lost in the UTC due to mine construction, operations, or closure.	Roads and other infrastructure can have significant impacts on aquatic biodiversity and productivity (see Maitland et al. 2016; Trombulak and Frissell. 2001; and Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology. Vol. 14. 1:18-30). The proposal includes an industrial road, with culverts, a buried pipeline and other road crossings along Upper Talarik Creek, which supports salmon and other subsistence species. Surveys of roads throughout Alaska that were supposed to support fish passage were unsuccessful (see https://www.fws.gov/alaska/fisheries/restoration/pdf/fish_passage_program.pdf https://www.arlis.org/docs/vol1/F/FishPassage/index.html) Please revise the conclusion of "no impact" or provide supporting documentation of why these actions will not impact species in Upper Talarik Creek.	Text revised throughout the DEIS for clarity: Excerpts from Section 4.24: *The road would be constructed through existing bedrock and glacial fluvial surface geology using locally processed materials with low erosion potential. Therefore, the indirect effects of erosion and sedimentation are expected to be limited to bridge or culvert crossings. The duration of construction-related sedimentation would be temporary and short term, due mitigation and control measures, permit stipulations, and timing windows. Additional monitoring, BMPs, and maintenance standards may be required by ROW lease stipulations from state and local governments.* *Bridge and culvert design, stream flows, and habitat loss would be reviewed and verified by Alaska Department of Fish and Game (ADF&G) during the permitting process… Permit stipulations may include seasonal restrictions on instream activities to avoid impacts to habitat during species critical life stages (e.g., spawning and egg development). Free passage of resident and anadromous fish may be temporarily interrupted, but would continue unimpeded after construction*

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					is complete. Habitat at the immediate location of culverts would be altered, but fish would continue to use the streams.
NPS	11	Section 4.24.21	Ferry Terminal/Iliamna Lake Pipeline	Ferry terminals can impact migrations of both adult and juvenile salmonids. The ferry port will be in the migration corridor of subsistence species migrating to spawning grounds throughout Iliamna and Lake Clark and smolt emigrating from freshwater to the sea. This section should address the following questions: How might this affect their migration? Will the ferry be treated with antifouling paints (typically containing copper, zine etc, which are toxic to fish) Will any treated pilings be used in construction? Will the terminal be lighted? Please see provided report of how ferry terminals and ferries can impact fish. Please revise or provide references for conclusion of "no impact". See additional studies of ferry terminal impacts on salmon showing impacts to behavior of juvenile salmon here: http://depts.washington.edu/trac/bulkdisk/pdf/472.1.pdf, https://www.wsdot.wa.gov/Research/Reports/600/648.1.htm and http://depts.washington.edu/trac/bulkdisk/pdf/272.1.pdf What are anticipated effects of potential spills of ore or an accident? How frequently are those anticipated to happen?	Text revised for clarity in DEIS: **Habitat Loss**; "*Docking facilities for the ice-breaking ferry at the north and south ferry terminals are expected to include rock and gravel ramps extending approximately 40 feet into Iliamna Lake. The magnitude and extent of impacts are such that the two terminals would remove 0.8 acre and 923 feet (0.2 mile) of approximately 300 miles of existing littoral zone. Rip-rap placed around the landing ramp would be similar in size and character to the boulder habitats currently present in both locations, and would not represent a novel habitat feature. Rip-rap would be colonized in the short term, and subsequently used by fish and their prey organisms. Habitat abutting fill locations may be disturbed or degraded during construction, but the duration of the impact would be short term, because habitat is expected to recover after construction activities are completed."* **Fish Migration:** "*As stated above, docking facilities for the ice-breaking ferry at the north and south ferry*

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					terminals are expected to include rock and gravel ramps extending approximately 40 feet into Iliamna Lake. There are no anticipated impacts to fish migration associated with these structures due to existing migratory habitat available in Iliamna Lake." Spill Risk is discussed in Section 4.27. No pilings are proposed for any of the ferry terminal facilities. Further discussion can be found in Chapter 2, Alternatives, of the DEIS.
NPS	12	Section 4.24.2.2	Timing (May 15 to July 15) of construction in anadromous fish streams according to the ADF&G Fish Habitat Permit would minimize impacts to out-migrating juveniles and avoid the presence of spawning adults.	This construction season would not avoid spawning adults. Spawning adult Chinook, Sockeye, and Coho Salmon all occur after July 15 in both systems. Spawning salmon were observed by Northern Dynasty consultants well into October. See NDM Progress Report. Chapter 4. 2004.	Comment acknowledged. Exact construction timing will be determined at time of project permitting.
NPS	13	Section 4.24.2.2	The extent or scope of these impacts would likely be limited to waters in the	NPS staff with experience working with impacts to fish at mine development sites suggest otherwise. There may be downstream changes in water quality and flow such as increased turbidity and	Comment acknowledged. Changes in water flow regimes are discussed in more detail in Section 3.16/4.16-Surface Water Hydrology.

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			vicinity of the mine site footprint, and may not be measurable or detectable downstream from the affected stream channel.	changes in water flow regimes. Please consider the extent of potential impacts to aquatic resources and subsistence fish resources.	
NPS	14	Section 4.24.2.2	No fish displacement or mortality would be expected in the UTC due to mine construction, operations, or closure.	Again please address WTP Discharge East?(See Fig. 2-3 and ADFG AWC maps) in this section. What will be discharged into upper Talarik from the waste tailpipe? What about fugitive dust from the tailings or waste rock? What will be the impacts of blasting at the mine site on the local area fish streams near the pit? Many of the streams in that region are groundwater fed during winter and provide important overwintering fish and incubation habitat. Will groundwater feeding into area streams be affected by potentially contaminated water from the mine site and pit?	There are no "waste tailpipe" discharges in the proposed action. Text revised in the DEIS: *The ADEC regulates wastewater discharges from hard-rock mining facilities through various permits, including:* *• APDES Individual Permit for point source discharge into wetlands and other waters* *• Integrated Waste Management Permit for solid waste disposal and wastewater discharge not into wetlands and other waters* *• APDES Multi-Sector General Permit for stormwater discharge* *• Domestic Wastewater Discharge Permit* *State of Alaska regulations require that the condition of these permits ensure compliance with the state water quality standards that are based on the use classification for the water body receiving discharge, and the state's anti-degradation policy. Some water bodies may also have site-*

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					specific water quality criterion. For constituents that exceed criteria in background surface water and groundwater (see Section 3.18.1 and Appendix K3.18), there are currently no plans to incorporate site-specific background levels of constituents into discharge limits (ADEC 2018-RFI 064a). *As described in Section 4.18, Water and Sediment Quality, fugitive dust would contribute metals to surface water, but would not exceed the water quality standards.* *Blasting would be necessary to construct the mine site, and would be ongoing during operations as the mine pit is developed. Blasting would occur near fish-bearing waters in the headwaters of the SFK and tributaries to the NFK. Blasting can cause in-water overpressures and particle velocities lethal to fish (Kolden and Aimones-Martin 2013).* *The estimated pressure and vibration forces generated by a blast would be included in the project's blasting plan. The blasting plan would be developed in consultation with ADF&G, and in compliance with guidelines and BMPs outlined in the ADF&G publication "Technical Report No. 13-03 – Alaska*

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					Blasting Standard for the Proper Protection of Fish." The magnitude of impacts from blasting on fish and fish habitat would depend on the proximity of the blast to fish habitat and the life stage of fish present in the affected area. The duration and extent of impacts would be temporary, and limited to the affected area. In general, fish would be temporarily disturbed, and could avoid the area for a period of time, but are expected to return with the cessation of blasting activities. Low levels of mortality are expected. These impacts would be expected to occur if the project is permitted and blasting is enacted, as planned for the mine site. See section 3.17, Groundwater Hydrology, for further discussions of groundwater.
NPS	15	Section 4.24.2.2	Ferry Terminals	Will there be any blasting associated with the construction of the ferry terminals? If so, please address impacts.	Ferry terminals would be gravel and rock ramps. Text revised in the DEIS: *Docking facilities for the ice-breaking ferry at the north and south ferry terminals are expected to include rock and gravel ramps extending approximately 40 feet into Iliamna Lake.*
NPS	16	Section 4.24.2.2	Propeller Entrainment or Injury	Adult Sockeye Salmon returning to spawn in Iliamna Lake generally follow the shoreline. How will the terminals affect their migration which can number in the	Text revised in the DEIS: *Docking facilities for the ice-breaking ferry at the north and south ferry*

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				hundreds of thousands, as well as on emigrating smolt.	*terminals are expected to include rock and gravel ramps extending approximately 40 feet into Iliamna Lake. There are no anticipated impacts to fish migration associated with these structures due to existing migratory habitat available in Iliamna Lake.*
NPS	17	Section 4.24.2.2	As discussed below under wake stranding, the ferry terminals are on exposed, high-energy beaches with no documented beach spawning habitat in the immediate vicinity; therefore, ferry operations impacting adult sockeye salmons is unlikely.	There is potential for adult salmon migrations to be impacted since the salmon follow the shoreline in large groups and will likely end up in the path of the ferry if the dock is built out in a solid wall versus piers that salmon could just swim under. Do you mean "impacting spawning Sockeye Salmon is unlikely?"	See above response. Text revised in the DEIS: *Sockeye salmon are known to use shoreline habitat for spawning, and therefore could be potentially affected; however, documented spawning areas are more than 0.5 mile from the ferry terminals and primary entry points of the pipeline into the lake (EPA 2014). Investigations by PLP have documented that nearshore lake habitat at the ferry terminal is lightly used by juvenile salmonids, and is not used for adult spawning (Paradox NR 2018a)*
NPS	18	Section 4.24.2.2	Consequently, any impacts on juvenile and adult fish due to boat wake would be extremely limited in scale—both spatially and temporally.	The EIS should consider the impacts of the actions in this section on harbor seals. What about the harbor seals?, which are an important subsistence resource and live year round in the lake on islands and along pressure cracks in the ice. Will they favor the ferry route the icebreaker makes? Will that increase potential for impacts? NPS recognizes that this topic may already be addressed in another	See Sections 3.23 and 4.23 - Wildlife Values, for a description of wildlife in the analysis area and potential impacts.

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				section.	
NPS	19	Section 4.24.2.3	. Streamflow reductions would begin during project construction, and would continue through operations and post-closure.	What is the anticipated net flow reduction into each system based on seasonal cycles?	See Sections 4.16 - Surface Water Hydrology, and 4.17 - Groundwater Hydrology, for a detailed description of flow regimes and potential impacts.
NPS	20	Section 4.24.2.3	Runoff and seepage water would be routed into the mill for ore processing and reuse, or routed to one of two water treatment plants for use in dust control or power plant cooling. Water would also be treated and released into stream channels at three locations:	How will water be treated and what will be the anticipated water quality and quantity upon release? Are any negative impacts to aquatic subsistence species anticipated? Because salmon imprint on stream natural water chemistry, how might the water chemistry change?	Text revised in DEIS: *The ADEC regulates wastewater discharges from hard-rock mining facilities through various permits, including:* • *APDES Individual Permit for point source discharge into wetlands and other waters* • *Integrated Waste Management Permit for solid waste disposal and wastewater discharge not into wetlands and other waters* • *APDES Multi-Sector General Permit for stormwater discharge* • *Domestic Wastewater Discharge Permit* *State of Alaska regulations require that the condition of these permits ensure compliance with the state water quality standards that are based on the use classification for the water body receiving discharge, and the state's anti-degradation policy.*

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NPS	21	Section 4.24.2.3	Treated water would be discharged to groundwater via buried infiltration chambers designed to provide energy dissipation, erosion control, and freeze protection.	Why is treated water being discharged to groundwater? How will it be monitored? Since groundwater from the mine region likely feeds subsistence salmon streams in the area what if any potential impacts might that have?	Treated water would be discharged to groundwater via buried infiltration chambers ***designed to provide energy dissipation, erosion control, and freeze protection.*** Text revised in DEIS: *The ADEC regulates wastewater discharges from hard-rock mining facilities through various permits, including:* *• APDES Individual Permit for point source discharge into wetlands and other waters* *• Integrated Waste Management Permit for solid waste disposal and wastewater discharge not into wetlands and other waters* *• APDES Multi-Sector General Permit for stormwater discharge* *• Domestic Wastewater Discharge Permit* *State of Alaska regulations require that the condition of these permits ensure compliance with the state water quality standards that are based on the use classification for the water body receiving discharge, and the state's anti-degradation policy.*
NPS	22	Section 4.24.2.3	Reduction in streamflows could directly impact the quantity and	Is there a quantitative estimate of reductions in streamflows for each river?	Please refer to 4.16 - Surface Water Hydrology, and 4.17 – Groundwater Hydrology, for this information.

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			quality of instream habitat for upstream migration of adult salmonids, spawning, and egg incubation, and rearing habitat for		
NPS	23	Section 4.24.2.3	(R2 Consultants 2018). Treated water releases from mine site facilities would be optimized to benefit priority species and life stages for each month and stream.	Please provide a copy of this report for review. NPS is unfamiliar with the measure "weighted usable area" and with the supporting quantitative studies. This is not part of Pebble's EBD or readily available in any scientific reference search or on R2s or Pebble's website. Please clarify. NPS is unfamiliar with mine sites releasing treated water to optimize "priority" species and life stages. Any citations to supporting documents would be useful.	Cited references are included in Chapter 9 of the DEIS.
NPS	24	Section 4.24.2.3	In general, most species would have larger-percentage reductions in usable spawning habitat in reaches just below the mine site than further downstream during project operations and	Provide citations to supporting documents or make the data and analysis available for review. Rearing habitat for these species will also be affected. What and where will these percent reductions be? How do these translate to loss of subsistence fish production for people over the life of the mine? Provide citations to supporting documents and make the data and analysis available for	Cited references are included in Chapter 9 of the DEIS. A time series assessment of the flow:habitat relationships, as predicted via the PHABSIM analysis and associated habitat suitability criteria (HSC), was utilized to assess the potential effects of mine-related changes in flow by stream reach on the quantity and quality of available habitat for various species and life-

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			post-closure. The percentage reductions in habitat would generally decrease in a downstream direction until reaching the confluence of the NFK and the SFK (with a few exceptions). Rain bow trout, chum, sockeye, Dolly Varden, and Arctic grayling would have habitat decreases only in the headwater tributaries. Chinook and coho spawning habitat would decrease throughout the NFK and SFK drainages. Once the mainstem Koktuli is reached, flow changes would not be detectable. Therefore, the downstream	review.	stages under 3 water-year types. The instream flow study (IFS) was initially implemented by HDR, then supported in following years by R2. The large breadth and scope of the IFS prevents a detailed description of the methods and results in the main EIS document, but specific details on the IFS methodologies can be found in R2 et al.. Summarized results are presented in Table 4.24-2 of this Chapter for spawning and Table 4.24-3 for rearing juveniles. The effects of flow changes on subsistence fish production would be as analyzed and presented in the EIS because 1) expected changes in habitat quantity and quality due to mine development are generally minor (or else show improvement), and 2) the relative productivity of target species in the NFK, SFK, or UTC represents a small fraction of the production in areas targeted by subsistence users (e.g., the NFK represents a minor fraction of Chinook salmon spawning habitat compared to the entire Nushagak River Basin).

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			extent of habitat impacts associated with flow reductions would be downstream of the confluence of the NFK and the SFK, and upstream of the mainstem Koktuli River confluence with the Swan River (the end of the model domain).		
NPS	25	Section 4.24.2.3	Throughout the mine site area in average precipitation years, Chinook and coho spawning habitat would be reduced; while chum, sockeye, rainbow, Dolly Varden, and Arctic grayling spawning habitat generally would be increased (Table 4.24.3). In wet years, the decreases in habitat would be lower, and the	How were these predicted changes in various species spawning habitats determined? What areas are included in these calculations? It is not clear whether there are quantitative models that examined habitat selection and preference by these species for potentially affected reaches. Please provide citation.	As noted in the preceding response, the habitat assessment used quantitative modeling tools that accounted for differences in reach characteristics, water year type, and species/life-stage selectivity for habitat attributes. See references listed above. Further discussion of modeling will be included in the EIS.

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			increases greater; in dry years, the habitat decreases would be greater and the increases would be lower. Post-closure, flow reductions would be lower than during mining, resulting in smaller reductions and increases in habitat.		
NPS	26	Section 4.24.2.3	Table 4.24-3 Average precipitation year	Please provide the scientific analysis that supports this table or citations to sources. How does this translate to changes in number of fish produced for subsistence users in the region over the life of the mine? What is an average precipitation year? How does this compare to predicted changes relative to climate changes forecast for the region over the life of the mine? Please provide citation.	Please refer to 4.16 - Surface Water Hydrology, and 4.17 – Groundwater Hydrology. Analysis and discussion of the climate variability and effects of long-term climate change have been expanded and/or revised in the DEIS including portions of Section 3.16, Surface Water Hydrology (Chapter 3, Affected Environment), Section 4.16, Surface Water Hydrology (Chapter 4, Environmental Consequences), and Technical Appendices K3.16 and K4.18. Further discussion of modeling will be included in the EIS.
NPS	27	Section 4.24.2.3	The trends in habitat change modeled in the entire mine area are shown in the	Provide the models and data to support these predicted changes, and describe how this applies to the tens of thousands of fish that spawn in these rivers and support subsistence? Please provide	Further discussion of modeling will be included in the EIS. Text 4.24 from DEIS:

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			changes in NFK spawning habitat. In average precipitation years during mine operations, salmonid habitat availability would decrease by 2.01 acres (8.1 percent) for spawning Chinook, and 1.86 acres (5.5 percent) for coho, while it would increase by 2.12 acres (5.8 percent) for spawning rainbow trout, 1.42 acres (4.4 percent) for sockeye, and 1.95 acres (5.5 percent) for Arctic grayling. Post-closure, habitat changes are predicted to be reduced to a 2.7 percent loss in Chinook, and 2.1 percent loss for coho. Habitat gains for the other	citation.	*The duration of direct impacts of the removal of anadromous habitat would be permanent. However, considering the low use of habitat to be removed (based on densities of juvenile Chinook and coho captured within these habitats), and the few numbers of coho spawning in these reaches, measurable impacts to populations of salmon from these direct habitat losses would be unlikely*.

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			species follow the same trend.		
NPS	28	Section 4.24.2.3	modeled	Are these trends predicated on the PHABSIM models submitted in the EBD? Or have new models and studies been conducted to correct the deficiencies in those models? Please see provided citation by Parasiewicz 2012.	The predicted changes in habitat availability due to mine-related effects are based on the IFS described above. The methodologies are presented in R2 et al. 2011. We recognize that no biologically-based flow model is perfect, however PHABSIM remains the most widely used and agency-accepted instream flow model within the U.S. (IFC 2009). Many of the criticisms noted by Parasiewicz do not account for the vast geographic scope, multi-year nature, and extreme environmental conditions associated with this project. We believe the methodologies employed in this study and the associated results represent the best available science for assessing potential impacts to aquatic species related to the proposed mine. Further discussion of modeling will be included in the EIS.
NPS	29	Section 4.24.2.3	Due to low-magnitude flow changes in the UTC basin, spawning habitat changes for all species would be less than 1	Construction and use of an industrial road and the other road crossings will potentially have an impact on salmon spawning habitat. Increased fine sediments, chemicals from truck brake pads, etc.	Comment acknowledged.

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			percent during both mining operations, and post-closure.		
NPS	30	Section 4.24.2.3	Juvenile salmonid habitat would be affected by the reduced flows associated with both mining and post-closure operations. In general, Chinook and rainbow trout juvenile habitat would be reduced, while sockeye juveniles (and the other salmonid species, to a lesser extent) would generally benefit from reduced flows associated with the mining operations. Sockeye juvenile habitat increases would generally be associated with the SFK-C reach, where habitat would be increased by 0.76	How does this translate into fish production? Supporting data is lacking regarding these claims. Please provide quantitative studies for review.	Further discussion of modeling with be included in the EIS including supporting rational for the increase in juvenile sockeye habitat.

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			acre (44 percent) during mining operations; while rainbow habitat losses would be greatest in SFK-190, where habitat would decrease by 0.15 acre (13.3 percent) during operations .		
NPS	31	Section 4.24.2.3	Table 4.24-4 Average precipitation year juvenile habitat for all streams and species in the mine site area pre-mine, during operations, and post-closure	Please provide citations and scientifically defensible quantitative data and analysis to back up the claim that there will be more Coho, Chinook, and Dolly Varden juvenile habitat during mining than prior to mining. The PHABSIM data do not support this claim (see Parasawicz 2012). The sockeye salmon in these systems do not rear in the river so it is not pertinent to include them in this table. Delete.	Further discussion of modeling will be included in the EIS. Table 4.24-4 has been revised in the DEIS.
NPS	32	Section 4.24.2.3	In average precipitation years, juvenile salmonid habitat availability would increase for all species by between 0.03 acre, or 0.2 percent (sockeye) and 0.96 acre or 2.9 percent (Arctic grayling), except	Clarify the measure average precipitation year. How does this compare with the predicted increases in precipitation for SW AK in the coming decades? And how does this translate to subsistence fish production?	Further discussion of modeling will be included in the EIS. The climate change section has been updated in the DEIS and is discussed in Sections 3.16 and 4.16 - Surface Water Hydrology.

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			for a decrease in rainbow trout habitat of 0.02 acre (0.2 percent). Post-closure, habitat changes would be reduced to less than 1 percent for all species. As mentioned above, the habitat changes would vary based on reach-specific conditions, with the largest percentage of changes occurring in small tributary NFK-190. However, in a downstream direction, reaches would alternate between habitat gains and losses for several species.		
NPS	33	Section 4.24.2.3	sockeye juvenile habitat of 0.73 acre (7.1 percent).	Juvenile sockeye salmon do not rear in-river.	Comment acknowledged. Juvenile sockeye salmon(age 0/+1) were documented in low numbers in the NFK, SFK and UTC mainstems indicating instream rearing—Pebble EBD Chapter 15.

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NPS	34	Section 4.24.2.3	Upper Talarik Creek Due to low-magnitude flow changes in the UTC basin, juvenile habitat changes for all species would be less than 1 percent during both mining operations and post-closure.	The impact of an industrialized road will impact quality and quantity of subsistence fish habitat. Will groundwater have to be pumped out of the pit constantly during operations? If so, does that groundwater also feed Upper Talarik Creek? Because groundwater is so critical for overwintering fish and incubating embryos, it seems that would be an important consideration.	Comment acknowledged. Please refer to Sections 4.16 - Surface Water Hydrology, and 4.17 - Groundwater Hydrology, for a description of water resources.
NPS	35	Section 4.24.2.3	In accordance with ADF&G criteria, bridge and culvert construction activities in anadromous waters would occur from May 15 to June 15, to avoid impacts to migrating salmon.	Based on NDM studies, spawning rainbow trout begin at breakup and adult salmon spawn throughout the entire summer through October. Impacts will be difficult to avoid and thus should be quantified and acknowledged.	Comment acknowledged.
NPS	36	Section 4.24.2.4	Baseline concentrations of dissolved organic carbon in the surface waters in the project area ranged from 1 milligram per liter (mg/L) to 2 mg/L; concentrations of	Please provide citation.	The EBD Water Quality citation will be added to EIS.

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			nitrate+nitrite ranged from 0.1 to 0.3 mg/L; and mean concentrations of total phosphorous ranged from 0.02 to 0.04 mg/L, indicative of oligotrophic nutrient status in the aquatic ecosystem.		
NPS	37	Section 4.24.2.5	disturb 8,130 acres of surface soil	This amount of soil disturbance will significantly change run-off patterns and has potential to increase occurrence of flashy flows such as urban areas experience.	The proposed action would be subject to state and federal water quality standards including installation and monitoring of BMP's as required by regulation to comply with the Clean Water Act. Further discussion is provided in Chapter 5 - Mitigation.
NPS	38	Section 4.24.2.5	surface runoff would be captured	Some of the surface runoff would be captured but, in high rainfall years and during spring breakup and fall floods, it will be extremely difficult to capture and control runoff. In addition, previously unexposed sulfide materials can generate acid runoff and introduce heavy metals toxic to aquatic life (copper, zinc, lead, etc.) into the environment affecting the entire aquatic food chain (see USEPA 1995, Maret and Macoy 2002, Maret et al. 2003, Daniel et al. 2015). This can impact fish species important to subsistence including anadromous salmon by impacting their ability to smell which is	Please see Sections 4.16 - Surface Water Hydrology, and Chapter 5 - Mitigation for detailed discussion of water management and mitigation measures.

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				how they identify predators, prey, kin and mates impacting survival (Baldwin, et al. 2003, McIntyre et al. 2006, Sandahl et al. 2006, McIntyre et al. 2012, Morin et al. 2012).	
NPS	39	Section 4.24.2.5	required state-of-the-process BMPs	Best Management Practices are not required and permit conditions, or applicable regulations, are generally just minimum requirements. BMPs are often not followed and therefore cannot be assumed to be applicable in the case of Pebble Project.	The proposed action would be subject to state and federal water quality standards including installation and monitoring of BMP's as required by regulation to comply with the Clean Water Act. Further discussion is provided in Chapter 5-Mitigation.
NPS	40	Section 4.24.2.5	Potential impacts on stream turbidity are not expected to occur at bridge or culvert crossings	Wherever dirt/gravel roads cross streams and particularly where heavy truck traffic occurs there will be increased sedimentation into streams at crossings, particularly during rain events. See earlier provided sedimentation references. If salmon or fish spawning and rearing habitat is present at crossings, subsistence fish production can be impacted depending on the amount of habitat lost or degraded. See provided references.	Text revised throughout the DEIS for clarity: Excerpts from Section 4.24: *The road would be constructed through existing bedrock and glacial fluvial surface geology using locally processed materials with low erosion potential. Therefore, the indirect effects of erosion and sedimentation are expected to be limited to bridge or culvert crossings. The duration of construction-related sedimentation would be temporary and short term, due mitigation and control measures, permit stipulations, and timing windows. Additional monitoring, BMPs, and maintenance standards may be required by ROW lease stipulations from state and local governments.*

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					Bridge and culvert design, stream flows, and habitat loss would be reviewed and verified by Alaska Department of Fish and Game (ADF&G) during the permitting process… Permit stipulations may include seasonal restrictions on instream activities to avoid impacts to habitat during species critical life stages (e.g., spawning and egg development). Free passage of resident and anadromous fish may be temporarily interrupted, but would continue unimpeded after construction is complete. Habitat at the immediate location of culverts would be altered, but fish would continue to use the streams.
NPS	41	Section 4.24.2.6	There are no anticipated impacts to fish migration associated with these structures due to existing migratory habitat available in Iliamna Lake.	Again, because Sockeye Salmon tend to aggregate and follow shorelines there may be impacts on adult and/or smolt migrations depending on design and materials used in construction of the ferry terminal.	Text revised in the DEIS: *As stated above, docking facilities for the ice-breaking ferry at the north and south ferry terminals are expected to include rock and gravel ramps extending approximately 40 feet into Iliamna Lake. There are no anticipated impacts to fish migration associated with these structures due to existing migratory habitat available in Iliamna Lake.* Text revised in DEIS: *Sockeye salmon are known to use shoreline habitat for spawning, and*

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					therefore could be potentially affected; however, documented spawning areas are more than 0.5 mile from the ferry terminals and primary entry points of the pipeline into the lake (EPA 2014). Investigations by PLP have documented that nearshore lake habitat at the ferry terminal is lightly used by juvenile salmonids, and is not used for adult spawning (Paradox NR 2018a).