United States Department of the Interior

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July 1, 2019

Mr. Shane McCoy
Program Manager, Regulatory Division
U.S. Army Corps of Engineers, Alaska District
645 G Street
Suite 100-921
Anchorage, AK 99501

Subject: Draft Environmental Impact Statement for Pebble Limited Partnership's Proposed Pebble Mine Project, Alaska

Dear Mr. McCoy:

The U.S. Department of the Interior (DOI) has reviewed the U.S. Army Corps of Engineers' (USACE) Draft Environmental Impact Statement (DEIS) on the proposed Pebble Mine Project (project). The DOI appreciates the opportunity to provide comments and recommendations, which are submitted in accordance with the Endangered Species Act (16 U.S.C. 1531-1544; ESA), Marine Mammal Protection Act (16 U.S.C. 1361-1407), Migratory Bird Treaty Act (16 U.S.C. 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), Clean Water Act (33 U.S.C. 1344), Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), Alaska National Interest Lands Conservation Act (16 U.S.C. 3101-3233), National Invasive Species Act (16 U.S.C. 4701 et seq.), National Park Service Organic Act (16 U.S.C. § 1 et seq.), Outer Continental Shelf Lands Act (43 U.S.C. 1331 – 1356), and National Environmental Policy Act (42 U.S.C. 4321 et seq.; NEPA) with implementing regulations.

The DOI's U.S. Fish and Wildlife Service (FWS), National Park Service (NPS), and Bureau of Safety and Environmental Enforcement (BSEE) are participating as cooperating agencies for this project. We appreciate the opportunity for the FWS, NPS, and BSEE to serve as cooperators. However, we must note that, despite being cooperators, they were only provided certain sections of the Administrative DEIS to review as it was prepared and were not able to access the entire document until after it was released for public comment. As planning for this project progresses, the bureaus look forward to working more closely with the USACE to address the concerns and recommendations noted below and in the attached enclosures.

Background

The Pebble Limited Partnership proposes to develop an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The Pebble Deposit is located at the headwaters of the South Fork Koktuli River, the North Fork Koktuli River, and Upper Talarik Creek, tributaries to the Nushagak and Kvichak Rivers which flow into Bristol Bay. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit.

The proposed project would consist of four primary project elements: 1) a mine site, 2) a transportation corridor, 3) a marine port, and 4) a natural gas pipeline. Additional details of these four primary project components include:

1. The mine site would include construction of an open pit, a tailings storage facility, a low grade ore stockpile, overburden stockpiles, material sites, water management ponds, milling and processing facilities, and supporting infrastructure such as a power plant, water treatment plants, camp facilities, and storage facilities.

2. The 83-mile transportation corridor would connect the mine site to a year-round port constructed for the project. The transportation corridor would have three main components: a private, double-lane road extending 30 miles south from the mine site to a ferry terminal on the north shore of Iliamna Lake; an ice-breaking ferry to transport materials, equipment, and concentrate 18 miles across Iliamna Lake to another ferry terminal on the south shore near the village of Kokhanok; and a private, double-lane road extending 35 miles southeast from the South Ferry Terminal to the selected port on Cook Inlet. There is also a road-only alternative under consideration that would not use an ice-breaking ferry to cross Lake Iliamna, but instead would route a road north of the lake and continue to the mine site.

3. A port would be constructed either near the mouth of Amakdedori Creek (Amakdedori Port) or at Diamond Point (Diamond Point Port) in Kamishak Bay and would include shore-based and marine facilities for the shipment of concentrate, freight, and fuel for the project. Other port facilities would include fuel storage and transfer facilities, power generation and distribution facilities, maintenance facilities, employee accommodations, and offices. Off-shore lightering locations would be used to transfer fuel and concentrate from large vessels to smaller vessels.

4. The approximately 188-mile natural gas pipeline would start on the Kenai Peninsula, cross Cook Inlet, and terminate at the mine site, with compressor stations located near Anchor Point and the Amakdedori Port. The 12-inch pipeline would follow the transportation corridor from the port to the mine site, crossing Iliamna Lake on the lake bed or following the north road on the road-only alternative.

General Comments

In our review of the DEIS, we identified several substantial deficiencies and areas for improvement, which are identified below. More specifically, the DEIS does not fully analyze and disclose potential effects to DOI-managed resources in many sections throughout the document. We offer recommendations, clarifications, and corrections that would address these issues. Please see the attached enclosures for detailed and complete comments, recommendations, and references to support a more robust impact analysis in the DEIS. To strengthen the document and its analyses, we also recommend the USACE more effectively and directly address prior comments submitted by the NPS and FWS. For example, responses to previous comments often cited conclusions from other sections of the DEIS to resolve concerns, but these citations did not sufficiently address the issues that were originally raised.

The DEIS, as prepared, does not follow NEPA requirements and conventions for data inclusion or analysis for an activity of this scope and scale. The DEIS precludes meaningful analysis (40 CFR 1502.9(a)).[1] It also lacks an index for cross-referencing (required by 40 CFR 1502.10(j)) and a robust discussion of cumulative effects (40 CFR 1502.10(g); 40 CFR 1502.16; 40 CFR 1508.7; 40 CFR 1508.25), including other "past, present, and reasonably foreseeable actions" (40 CFR 1508.7 and 1508.8).

Due to the substantial deficiencies and data gaps identified in the document and as a department with multiple cooperating agencies, the DOI recommends that the USACE prepare a revised or supplemental DEIS. We suggest the supplemental DEIS incorporate an index to facilitate public review, so that potential impacts are adequately disclosed to the public and also to aid agency reviewers. We also recommend that the DEIS include a more robust discussion of cumulative effects and additional past, present, and reasonably foreseeable actions. We welcome the opportunity to work with the USACE to improve these analyses.

Subsistence

Subsistence resources and continuation of subsistence practices are extremely important to the subsistence communities in the vicinity of lands managed by our bureaus. The subsistence sections in the DEIS do not properly portray important considerations for subsistence activities by Alaskans. The analysis is insufficient and does not fully disclose potential impacts to subsistence resources and the communities that depend on them.

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[1] **§1502.9 Draft, final, and supplemental statements.**
Except for proposals for legislation as provided in §1506.8 environmental impact statements shall be prepared in two stages and may be supplemented.
(a) Draft environmental impact statements shall be prepared in accordance with the scope decided upon in the scoping process. The lead agency shall work with the cooperating agencies and shall obtain comments as required in part 1503 of this chapter. The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action.

For example, the document states subsistence is a chosen lifestyle, rather than acknowledging subsistence is an integral component of local cultures. The analysis assumes that subsistence locations are readily interchangeable if impacts displace subsistence activities from traditional areas. Displacement could occur through physical displacement (development of infrastructure), visual impacts (change in setting or sense of place), or from real or perceived contamination of resources. The document only minimally acknowledges the potential causes of displacement of subsistence users and does not acknowledge or analyze the potential for displacement due to actual contamination of resources, particularly due to fugitive dust and potential impacts to water quality. The DEIS fails to consider the total direct and indirect effects of the actions on subsistence. For example, the combination of the impacts on water quality and thermal regimes could have a substantial impact to fish species availability and distribution. Water quality, chemistry, and temperature are extremely relevant to impacts on subsistence fisheries resources.

We recommend working with NPS and FWS to more robustly incorporate important Alaska subsistence constructs to fully analyze and disclose potential impacts to subsistence resources and communities in the supplemental DEIS.

Fish and Wildlife Resources

The DOI's trust resources include natural resources that we have been entrusted to protect for the benefit of the American people; these resources include federally-listed threatened and endangered species and their designated critical habitats, migratory birds, bald and golden eagles, certain marine mammals, interjurisdictional fish, and the habitats upon which they depend. The Bristol Bay watershed, including the Nushagak and Kvichak Rivers, supports all five species of Pacific salmon (King, Sockeye, Coho, Pink, and Chum), and several other commercially, recreationally, and ecologically important fish species. The Bristol Bay watershed is also home to brown bear, black bear, moose, caribou, wolves, waterfowl, and many other species of mammals and birds (Brna and Verbrugge 2013). Federally-threatened northern sea otters and Steller's eiders occur in the waters of Cook Inlet, including Kamishak Bay (where they occur in relatively high abundance). Bald eagles nest and feed along the coast and along all of the major salmon spawning rivers in the Bristol Bay and Cook Inlet regions. A relatively high number of golden eagles are also found throughout the mine site and transportation corridor. Migratory birds, including waterfowl, shorebirds, and land birds, are abundant throughout the potentially affected area of the proposed project.

Responding to local concerns, the U.S. Environmental Protection Agency published the Bristol Bay Watershed Assessment (USEPA 2014), a rigorous, peer-reviewed, scientific document designed to understand Bristol Bay's resources and evaluate the impacts development of a large-scale mine would have on fisheries in the area. According to the USEPA assessment, the Bristol Bay watershed "supports the largest sockeye salmon fishery in the world, is home to 25 federally recognized tribal governments, and contains significant mineral resources. The potential for large-scale mining activities in the watershed has raised concerns about the impact of mining on the sustainability of Bristol Bay's world-class commercial, recreational, and subsistence fisheries and the future of Alaska Native tribes in the watershed, who have maintained a salmon-based culture and subsistence-based way of life for at least 4,000 years (USEPA 2014)." The watershed assessment concluded that destruction of streams and wetlands, along with water

withdrawals from a hypothetical mine, would result in the decline of local populations of salmonids (USEPA 2014).

The DOI is concerned that developing an open pit mine and associated infrastructure at the headwaters of critical salmon habitat could cause permanent, adverse impacts to the ecologically and economically important Bristol Bay watershed, its world-class fisheries, and the commercial, recreational, and subsistence users who depend on them. The DEIS does not acknowledge the importance of the Bristol Bay river system in supporting roughly half of the world's sockeye salmon population, and potential impacts to these fishery resources are underestimated. We recommend that the USACE incorporate the USEPA assessment into the discussion of the project's potential impacts on the Bristol Bay fish resources in the supplemental DEIS.

Because activities associated with the proposed project are expected to occur over an approximately 25-year period, the DOI recommends including a discussion of predicted environmental changes over that timeframe in the DEIS. For example, warming trends in the region are well documented; additional alterations of natural temperature regimes would likely further stress fish populations, alter distribution, and decrease abundance and availability of fish for recreation and subsistence uses.

Further, contaminants, including selenium, may pose substantial risks to aquatic life and subsistence resources and has the potential to decrease fish populations and limit the availability of fish resources for subsistence and recreation purposes, possibly for generations. Water quality changes that could occur due to proposed development are estimated to change natural water quality concentrations, sometimes by orders of magnitudes. This could have effects on salmonid homing ability and long-term productivity, yet these effects are not evaluated, nor are cumulative effects fully analyzed. Prior comments and references submitted by the NPS and FWS on this topic provide specific context. The DOI recommends that these comments be used to more effectively address this issue, particularly regarding Section 4.24 Fish Values and Section 4.9 Subsistence.

At the time the DEIS was released, the USACE had not engaged the FWS in consultation pursuant to section 7 of the ESA. Therefore, discussions of the ESA compliance are preliminary in nature. While the FWS conducted a cursory review of the draft biological assessment as part of their NEPA review of the DEIS (see Enclosure 1), their comments should not be misconstrued as a thorough review of the biological assessment or as meeting consultation or compliance requirements.

Moreover, we recommend the USACE revisit the analysis in the DEIS and the draft biological assessment for federally-listed northern sea otters and their designated critical habitat. The information presented in these documents inadequately analyzes and significantly minimizes the potential effects the project may have on northern sea otters and their designated critical habitat. Based upon the available information, the DOI does not agree with the conclusions drawn in the draft biological assessment for sea otters and sea otter critical habitat. We encourage the USACE to engage the FWS in consultation pursuant to section 7 of the ESA, in order to discuss the necessary analysis. FWS is available to assist the USACE in meeting the joint responsibilities under the ESA.

Additional comments provided in the enclosures of this letter cite numerous peer-reviewed resources that can be used to strengthen the analyses in the DEIS. The DOI has bureau staff with substantial expertise in this area who can work with USACE to fully address the underlying fisheries analysis and the subsequent evaluation of potential impacts to subsistence resources, subsistence communities, recreation resources, and many recreation entities (commercial recreation, Alaska residents, and independent non-resident recreation).

Aesthetics and Recreation

The impact analysis in the DEIS for visual resources/aesthetic values is incomplete and does not include an analysis of the light diffusion of the mine site and proposed transportation routes or efforts to mitigate the light diffusion. In particular, a more complete analysis would include a lighting plan and consideration of light impacts from key observation points located/analyzed in Lake Clark National Park and Preserve. To more completely estimate night sky impacts, NPS conducted an analysis of potential impacts in the vicinity of Lake Clark National Park and Preserve and Katmai National Park and Preserve. This analysis evaluated four scenarios contrasting potential impacts from lights—with and without shielding and with and without snow cover. The NPS will provide this report and associated map to the USACE under separate cover. Because there is minimal artificial lighting in the region, the night sky is essentially unaffected at this time. The potential effects of the proposed mine lighting would substantially change the nighttime viewsheds within both parks.

We also offer recommendations to better estimate impacts to these resources in Enclosure 2. Our comments include an analysis of potential impacts to night skies in the vicinity of the proposed project area, and NPS is happy to work with the USACE to more fully incorporate potential impacts to visual resources, including night skies.

Additionally, the potential decrease in recreation use due to aesthetic impacts has been overlooked. Guided fishing and hunting, sport hunting and fishing, as well as the previously mentioned subsistence uses could be substantially displaced due to effects on visual resources in the area. Scenic resources, hunting and fishing opportunities are the primary draws for recreation in this area. Development of roads, port facilities, and substantial infrastructure associated with the mine site would alter scenic resources in the area, potentially displacing recreation users. We recommend working with NPS to resolve these issues and discuss responses to prior comments submitted on this topic.

Spills and Contamination

The analysis of spill risks and potential impacts needs to be bolstered considerably. The DEIS failed to adequately assess the risk of spills and contamination, and it does not convey the magnitude of the threats posed by reasonably foreseeable incidents, which could occur during construction and mine site operations. Various mine-related activities, including transportation, port, and lightering operations, could potentially result in diesel fuel spills from fuel tanker truck rollovers, marine tanker vessel collisions, ferry incidents, and fuel storage tanks/tank farms operations; these activities could also potentially lead to concentrate slurry spills, spills associated with the transport and lightering of copper-gold concentrate, and the release of tailings. Such incidents could have significant impacts to marine, coastal, and terrestrial

resources. For more extensive comments and recommendations, please see the attached enclosures.

We recommend the USACE revisit the analysis conducted for Section 4.27 Spill Risk in the DEIS. The scenarios analyzed in the section do not fully disclose the potential effects of the proposed project. The limited spill scenarios and the analysis on the effects on the natural, economic, and cultural values of multiple downstream natural resources, particularly salmon, is not well supported with data. The impacts of spills are minimized or dismissed as not being "measurable," but no measurement types or measurable variability (as would be generated in a power analysis or detection limits) are given. Considering the absence of specific, measurable criteria regarding effects, the conclusions presented in the DEIS that there would be "no measurable effects" are unsupported and do not allow the public, USACE, DOI, or other regulatory agencies to evaluate the consequences of any spill scenario or distinguish among alternatives.

The DEIS does not fully consider the potential for contamination due to fugitive dust from the mine site, transportation corridors, and during transfers for water-based shipping. Enclosed containers for transport of products is an accepted standard to reduce fugitive dust propagation. Assuming enclosed containers would be used, most of the contaminant-bearing fugitive dusts would likely be dispersed via vehicles tracking onto road surfaces. Mitigation measures to reduce fugitive dust would include year-round vehicle washing stations at the exit of the mine site, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities. We recommend monitoring soils, vegetation, and water quality in the vicinity of the mine site, transportation corridors, and transfer facilities. We have provided numerous peer-reviewed references to strengthen the analysis in Enclosure 2 and have bureau staff with substantial expertise in this area.

The DEIS would also benefit from an analysis of the full range of consequences from potential spills or inadvertent releases at the mine site and along the transportation routes. Although potential effects may be readily dispersed or diluted, contamination has the potential to affect the marine environment as well as associated terrestrial wildlife, whether the contamination source is incremental deposition of fugitive dust over time or from a low probability, but high consequence event, such as a concentrate release in the freshwater Iliamna Lake or in the marine environment. Clams and other bivalves can accumulate toxins, particularly metals and petroleum compounds. Animals that feed on them, including brown bears in Lake Clark National Park and Preserve, could be exposed to these toxins via bivalve prey that were contaminated from spills, inadvertent releases, or fugitive dust from the mine or transportation sites. For these reasons, we believe the potential for incremental impacts to bears and other terrestrial species, as well as marine species is also high. While the potential for a large-scale spill may be low, the consequences would be high. We recommend disclosing the full range of potential effects in the supplemental DEIS.

Pipeline

Although the DEIS contained information regarding the potential environmental effects of placing a pipeline in Cook Inlet, it does not include the detailed hazards data that Pebble Limited

Partnership is still in the process of collecting to ensure that the proposed corridor has no unanticipated risks that would affect the pipeline's safe operation. The DOI does not expect this additional data to appreciably change the assessment in the DEIS; however, if the data does alter the analysis after the current comment period closes, the public would have a limited opportunity to comment on a revised assessment. As a cooperator, BSEE will continue its review of the proposed pipeline corridor and assess potential hazards prior to approving a right-of-way permit for the pipeline.

Invasive Species

While the DEIS discusses the current state of invasive species in the project area, it does not adequately address potential impacts from the reasonably foreseeable introduction of invasive species nor how they would be detected and remediated. Invasive species are among the greatest threats to native biodiversity, and Alaska is particularly vulnerable to the expansion of invasive species because of rapidly changing habitat caused by shifting weather conditions, altered hydrologic regimes, and increasing urban and natural resource development. We recommend the DEIS analyze the potential introduction of invasive species during construction and shipping activities, as well as incorporate prevention, early detection, and remediation plans for invasive species in the supplemental DEIS. Additional specific recommendations are provided in Enclosures 1 and 2.

Cumulative Impacts

The cumulative effects analysis in the DEIS is incomplete. We recommend the USACE conduct additional analysis to assess cumulative environmental impacts that could reasonably be expected to occur following development of the described mine plan, including full buildout of the Pebble Deposit in the reasonable and foreseeable future and development of additional mining claims in the region that would become economically feasible if infrastructure for the proposed project, including port facilities and a road system, is constructed.

The DEIS takes the view that the elimination and degradation of salmon habitat will have incremental and linear (yet undetectable) effects on salmon populations, but collapses and extirpation of salmon populations from both coasts of the U.S. (and around the world) have shown that habitat loss and degradation from multiple sources can add up in ways that eventually lead to the demise of productive, self-sustaining salmon populations (Nehlsen et al. 1991, Lichatowich 1999, Montgomery 2003). The need for a thorough assessment of cumulative impacts from past, present, and reasonably foreseeable future actions is particularly acute given that the Nushagak and Kvichak watersheds are integral components of one of the world's few remaining wild-salmon-based ecosystems and major contributors to the world's largest wild salmon fishery. These fisheries are also vitally important for subsistence users and provide recreational opportunities for park visitors.

Mitigation, Management, and Reclamation

We recommend the USACE (and/or the applicant) fully develop the proposed mitigation, management, and reclamation plans currently referenced in the DEIS and then re-analyze the

project's impacts on area resources. The public, the USACE, and resource agencies cannot fully evaluate the proposed project's impacts without knowledge of specific details included in these plans. Please note that the Council on Environmental Quality's NEPA Regulations and Appropriate Use of Mitigation Memo (40 CFR 1502.16(h), CEQ 2011) states an EIS must contain an analysis of environmental consequences of the action, alternatives, and the means to mitigate adverse environmental effects. We have included recommended habitat mitigation measures in Enclosure 3 for USACE use and request the opportunity to review mitigation, management, and reclamation plans as they are developed.

In summary, the DEIS does not fully discuss the potential impacts of the proposed mining activity on DOI-managed resources and lacks a number of important analyses that are necessary to adequately assess the project. Therefore, we recommend that the USACE prepare a revised or supplemental DEIS to resolve the significant gaps in the current document. The FWS, NPS, and BSEE look forward to working with the USACE on improving this important analysis.

Thank you again for the opportunity to collaborate and provide comments on this project. If you have any questions regarding FWS comments, please contact Douglass Cooper, Ecological Services Branch Chief, (907-271-1467 or douglass_cooper@fws.gov) or Catherine Yeargan, Senior Fish and Wildlife Biologist, (907-271-2066 or catherine_yeargan@fws.gov). For questions regarding NPS comments, please contact Joan Kluwe, Environmental Protection Specialist, at joan_kluwe@nps.gov or 907-644-3535. For comments pertaining to the BSEE, please contact John McCall, Engineer, at 907-334-5308 or john.mccall@bsee.gov.

Sincerely,

Philip Johnson
Regional Environmental Officer – Alaska

Enclosure 1: U.S. Fish and Wildlife Service Public Comment Review, Pebble Limited Partnership Draft Environmental Impact Statement
Enclosure 2: National Park Service Comments on Pebble Draft EIS
Enclosure 3: U.S. Fish and Wildlife Service Recommended Mitigation Measures for Inclusion in the Pebble Limited Partnership Draft Environmental Impact Statement and Management Plans

Literature Cited

Brna, P.J., and L.A. Verbrugge, eds. 2013. Wildlife resources of the Nushagak and Kvichak River watersheds, Alaska. Final Report. Anchorage Fish and Wildlife Field Office, U.S. Fish and Wildlife Service, Anchorage, Alaska. 177 pp.

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Nehlsen, W., J. Williams, and J. Lichatowich. 1991. Pacific salmon at the crossroads—stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16:4-21.

[USEPA] U.S. Environmental Protection Agency. 2014. An assessment of potential mining impacts on salmon ecosystems of Bristol Bay, Alaska. Region 10, Seattle, Washington. EPA 910-R-14-001.

Enclosure 1: U.S. Fish and Wildlife Service Public Comment Review, Pebble Limited Partnership Draft Environmental Impact Statement

General Comments and Recommendations

The U.S. Fish and Wildlife Service (Service) offers the following comments on the U.S. Army Corps of Engineers' (USACE) Draft Environmental Impact Statement (DEIS) for the Pebble Limited Partnership's (PLP) proposed development of an open-pit surface mine, along with associated infrastructure, at the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit), located in the Iliamna region of southwest Alaska and within the Bristol Bay watershed.

After thorough review, we believe the DEIS has major outstanding issues related to an overreliance on qualitative, subjective, and unsupported conclusions. There are also instances where the USACE failed to conduct or include important analyses and where effects are minimized or dismissed as not being "measurable" without providing the measurement types or measurable variability used. Based on these identified deficiencies, the DEIS is so inadequate that it precludes meaningful analysis 40 CFR 1502.9(a))[1]. The Service recommends the USACE develop a revised DEIS that expands the scope and detail of the environmental analysis conducted to ensure the public, the USACE, the Service, and other regulatory agencies are fully informed of the potential impacts of the proposed project and are able to evaluate and compare the proposed alternatives. Specifically, the Service recommends the USACE prepare and circulate revised analysis on the following sections: Spill Risk, Fishery Resources, and Threatened and Endangered Species.

Whenever possible, our comments are quantitative and specific (e.g., incorporate a relevant data set or more recent report into an analysis, run a specific spill scenario, etc.). However, in many instances the general nature of the inadequate or incomplete analysis contained in the DEIS resulted in us only being able to provide qualitative comments. Below, we provide comments and recommendations that are solution focused and intended to improve the overall environmental analysis of the proposed project.

DEIS Format and Structure

- The DEIS, as prepared, does not follow the National Environmental Policy Act (NEPA) requirements and conventions for data inclusion or analysis for an activity of this scope and scale. The DEIS lacks an index for cross-referencing (required by 40 CFR

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(a) Draft environmental impact statements shall be prepared in accordance with the scope decided upon in the scoping process. The lead agency shall work with the cooperating agencies and shall obtain comments as required in part 1503 of this chapter. The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action.

1502.10(j)) and a robust discussion of cumulative effects (40 CFR 1502.10(g); 40 CFR 1502.16; 40 CFR 1508.7; 40 CFR 1508.25), including "irreversible and irretrievable commitment of resources" and other "past, present, and reasonably foreseeable actions" (40 CFR 1508.7 and 1508.8). The Service recommends including an index and a more robust discussion of cumulative effects and additional past, present, and reasonably foreseeable actions in the DEIS.

- An analysis of the incremental impacts of the proposed action is missing. Direct and indirect effects are stated in each resource section, but the analysis of overlapping effects is missing. The Service recommends adding a summary of project related effects to the end of each resource section listed in Chapter 4, or adding a summary to the beginning of each Cumulative Effects section. According to 40 CFR 1508.7, a cumulative impact includes the incremental impacts of the action (this is the overlap of direct and indirect impacts) together with the effects of other reasonable and foreseeable actions. Table 4.23-3, for example, states the effects associated with the three parts of the project (the mine, pipeline, and transportation corridor), but does not state the cumulative effects of direct and indirect impacts upon the resource. According to the NEPA regulations, "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). We recommend the DEIS include a summary of project related effects for each chapter, such as found in the wildlife chapter.

DEIS Analysis of Biological Impacts

- The DEIS does not adequately address the project's potential impacts on the Bristol Bay commercial, recreational, and subsistence salmon fishery. We recommend the USACE revisit the analysis for the project's impacts to the fishery and fish resources, and incorporate additional information and analysis into Chapter 4.24 Fish Values and Chapter 4.27 Spill Risk. The *U. S. Environmental Protection Agency's Bristol Bay Watershed Assessment* (Watershed Assessment) (USEPA 2014) was developed to provide information on the potential impacts that a proposed surface mine and associated infrastructure may have on area fish and wildlife resources; the USACE should incorporate this assessment into the discussion of the project's potential impacts on the Bristol Bay fishery and fish resources.
- The DEIS should analyze the cumulative effects on biological resources (such as fish and wildlife) caused by1) incremental impacts on physical resources (such as soil, water, air, and vegetation), 2) changes in flow regime and changes in water temperature, and 3) human disturbance, noise, degradation of habitat, and potential contamination. Cumulative effects from incremental impacts associated with the proposed action could result in loss of habitat and displacement of fish and wildlife, including injury and mortality that would be irretrievable. According to the NEPA regulations (40 CFR 1502.16), the environmental consequences section should include a discussion of the loss of these resources. In addition, the incremental impacts of the action should be analyzed with the impacts for existing and reasonably foreseeable future actions.
- The reasonably foreseeable future action for the Pebble Mine buildout scenario analyzed 55 percent of the resource, but did not analyze the cumulative effects of additional dewatering in the project area. Similarly, not all of the infrastructure that would be

associated with complete build out was considered, as stated on Page 4.1-8. A similar expansion concept was analyzed as Pebble 6.5 in the Watershed Assessment (USEPA 2014). We suggest summarizing analysis from the Watershed Assessment in this section of a revised DEIS.

Finally, because activities associated with the proposed project are expected to occur over an approximately 25-year period, the Service recommends including additional discussion of ways predicted changes in environmental conditions over that timeframe could alter human use, wildlife resources, and vegetation in the project area. This discussion is an important component of analyzing the project's cumulative effects.

Invasive Species Comments and Recommendations

The DEIS does not adequately address potential impacts that could occur through the introduction of invasive species, or how invasive species would be detected and remediated, through all aspects of the project. Invasive species are one of the greatest threats to native biodiversity and are a significant driver of native species loss worldwide. Alaska is particularly vulnerable to the expansion of invasive species because of rapidly changing habitat caused by shifting weather conditions, altered hydrologic regimes, and increasing urban and natural resource development.

The DEIS does not address how operations would include prevention, early detection (surveys), and rapid treatment response in the event invasive species are introduced as a result of project activities. We recommend adding additional details about the potential introduction of invasive species during construction and shipping activities, along with prevention, early detection, and remediation plans for invasive species. We recommend these plans address:

- The potential introduction of invasive terrestrial plants. Additional information about certified weed-free gravel and supplies for road corridor construction (hay bales, wattles, blankets) and pipeline construction should be discussed.
- The threat and prevention of introduced submerged aquatic vegetation (e.g., *Elodea*) and the transfer of aquatic plants from other infested waterbodies in the state.
- The potential introduction of invasive terrestrial invertebrates that may be brought in on construction supplies and equipment and how their transfer would be prevented.
- The prevention of and response to the introduction of invasive terrestrial vertebrates (e.g., rodents). Rats and mice have significant impacts on native birds and mammals when introduced into an area. The project site is immediately adjacent to multiple islands managed by the Alaska Maritime National Wildlife Refuge to sustain seabirds. The project could pose a risk for the introduction of rodents through normal operation of marine vessels, or in the event a vessel becomes adrift and stranded on the mainland or on an island. One example of important seabird habitat in the area is the Barren Islands, islands on the south end of the Kenai Peninsula.
- The potential for the introduction of marine invasive species.
- The impacts of various invasive species treatments methods such as, but not limited to, herbicides or rodenticides.

Invasive species are the second greatest driver, behind habitat loss, of human-caused extinctions (Grosholz 2005; Sax & Gaines 2008). Wildlife could be directly and indirectly affected by the spread of terrestrial and marine invasive species (i.e., vertebrates, plants, and invertebrates) throughout all phases of the project, with impacts to the terrestrial system beyond the life of the project, if not prevented, surveyed for, and rapidly addressed when found (Hulme 2009). The construction and use of project infrastructure (e.g., roads, platforms, ports, lightering stations) are the most likely vector sources for the introduction of these species. For example, barges and marine vessels are vectors of invasive mammals such as rats, which eat eggs, nestlings, and adult birds (e.g., waterfowl, shorebirds, and seabirds; Ebbert and Byrd 2002). As such, near-shore and on-shore project operations could pose a threat to birds and their coastal habitats. Furthermore, the construction and use of the proposed road system(s) and ports along Lake Iliamna can facilitate invasions of terrestrial plants from outside of the project area.

The DEIS states there are currently no known invasive plants in the project area; however, significant amounts of construction equipment and materials would be brought into the site(s). Without adequate protections in place, the equipment and materials would serve as a vector for new invasions. Across North America, invasive plants have replaced native vegetation, resulting in ecological impacts (e.g., soil erosion, loss of wildlife forage) as well as economic losses to agricultural production and wildlife-associated recreation (Duncan et. al 2004). The introduction of invasive species could lead to reduced water quality, loss of habitat for native species, increased mortality rates of native species, collapse to food-web dynamics, and infrastructure failure (Carey et al. 2016, Herbert et al. 2016, Simpson et al. 2016).

Commercial and Recreational Fisheries

The Service has significant concerns about the project's potential impacts to the Bristol Bay commercial, recreational, and subsistence salmon fishery. The Kvichak River system has historically been the largest contributor to the Bristol Bay fishery, the largest producer of sockeye salmon in the world (Fair 2000). Sockeye salmon are a valuable cultural, subsistence, economic, and ecological resource and have comprised over 50 percent of the total subsistence harvest in nearly all of the Kvichak River watershed communities of southwest Alaska (Fall et al. 2001). Schindler et al. (2010) further states, "[t]he total economic value of this fishery is considerably higher when considering the retail, cultural and recreational value of these fish. Income from sockeye salmon in the Bristol Bay is the major source of personal income for most Bristol Bay communities, and landing taxes provide the major funding for local school districts. Thus, the interannual reliability of this fishery has critical and direct consequences for the livelihoods of people in this region." An economic study of the Bristol Bay salmon industry found the output value of the fishery to be worth $1.5 billion annually, supporting an average annual employment of approximately 10,000 jobs (Knapp et al. 2013). The DEIS does not acknowledge the importance of the Bristol Bay watershed supporting roughly half of the world's sockeye salmon. The current analysis and accompanying discussion contained in the DEIS do not accurately identify and analyze the project's potential impacts to the Bristol Bay fishery. We recommend a more thorough analysis and disclosure of the full range of potential effects to salmon and their habitat from groundwater contamination, potential spills, or a tailings dam failure.

Chapter 4.6: Environmental Consequences

- The Service recommends the revised DEIS consider the impacts of landscape-scale industrialization on the region's multimillion dollar sport fishing industry. While the Kvichak and Nushagak watersheds attract anglers from around the world to pursue abundant, trophy-sized, wild Rainbow Trout, anglers (who pay up to $10,000 for a week of guided, lodge-based angling) consistently rated attributes related to the wilderness setting and natural beauty of the area as important in choosing this destination (Duffield et al. 2006). Viewing mining infrastructure during airplane or boat trips to fishing streams – or merely knowing that such infrastructure is present – may diminish the quality of the experience and may make anglers less willing to bear the high cost of trips to this area.

Subsistence

Chapter 3.9: Affected Environment

We recommend the USACE include additional information related to the discussion of Affected Environment, as detailed below:

- Section 3.9 of the DEIS delineates the importance of fishing and hunting for communities (materially and socially) and adequately describes subsistence harvest and practices based on a few key studies. However, in describing the social, cultural, and traditional values associated with subsistence activities, the DEIS asserts, "for many, subsistence is a chosen lifestyle." For most Alaska Native people and many other non-Native rural residents, subsistence is a way of life and exceeds the framework of "choice."
- On Page 3.9-2, the DEIS discusses the regulation of subsistence activities by the Federal government through Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) and a rural Alaskan subsistence priority on federal public lands. The DEIS asserts that no project components are proposed on federal lands and thus ANILCA would not apply. However, federal fisheries regulations do apply in the Kvichak/Iliamna-Lake Clark drainage, and federal hunting regulations apply on the National Park Service and the Bureau of Land Management lands in Units 9 and 17. While project activities would take place on state lands, fish and wildlife do not recognize jurisdiction. Therefore, although the Pebble development would not take place on federal lands, it has the potential to significantly impact federally qualified subsistence users and the resources on which they rely; this potential should be acknowledged in the DEIS.

Chapter 4.9: Environmental Consequences

We recommend the USACE include additional information and discussion of subsistence user perceptions related to the proposed project, as detailed below:

- The DEIS does not adequately attend to the very real potential impact of perceptions of contamination on continued subsistence access. The description of anticipated possible

impacts on subsistence practice in Section 4.9 does not acknowledge the role that understandings, beliefs, and perceptions of contamination and ecosystem compromise could have on hunting and fishing in practice. Due to subsistence users' historical experiences with lack of transparency from government and industry, the presence of mining is likely to lead to at least some avoidance of, and reduction in, use of fish and other subsistence resources, even in the absence of a specific contamination event. Furthermore, if there is a contamination event, the complications of habitat restoration in an interconnected hydrologic and ecological system means there may be difficulty in achieving closure (i.e., the belief that the environment has been healed and it is safe and healthy to once again practice subsistence). "Voluntary" reduction of use of salmon, other fish, and resources (as well as caribou, moose, brown bears, berries, and greens) due to concerns about unknown or unknowable contamination could prevent subsistence users from hunting, fishing, and gathering. There is potential to significantly impact mental, spiritual, and community health if core resources are perceived to be contaminated and detrimental to human health. This could in turn interrupt transmission of customary and traditional knowledge and practices, resulting in irreversible change to the local cultural and subsistence way of life.

Transportation and Navigation

Chapter 4.12: Environmental Consequences

- Marine shipping is a vector for the introduction of marine invasive species, which can have direct and indirect impacts to commercial and recreational fishing. Marine invasive species are spread through hull fouling and ballast water discharge. As such, ports in Alaska receiving vessels from outside of Alaska are susceptible to receiving invasive species that are transported by fouling/ballast water from all over the world (Reimer et al. 2017). The DEIS discusses using barges to move concentrate to bulk carriers in deeper water in the Gulf of Alaska, but does not discuss the impacts that ballast water/biofouling from these marine vessels may have on native species. The Service recommends including a discussion of impacts the introduction of invasive marine species could have on native species; the Service also recommends developing prevention, detection, and response plans for marine invasive species, and incorporating these plans into a revised DEIS. The Service is available to assist the USACE and PLP in the development of these recommended plans.

Air Quality

Chapter 4.20: Environmental Consequences

- The Service recommends including a discussion of the potential impacts of the project on the Tuxedni Wilderness. The Tuxedni Wilderness was established as a refuge for seabirds, bald eagles, and peregrine falcons; and it contains large colonies of black-legged kittiwakes, horned puffins, common murres, pigeon guillemots, and glaucous-winged gulls. The 5,566-acre Tuxedni Wilderness (including the Chisik and Duck Islands), designated in 1970, is a Class 1 air quality area under the Clean Air Act (FLM

2010; MOU 2011). It is administered by the Alaska Maritime National Wildlife Refuge, and the Service is responsible for protecting the air quality and air quality related values of the area from man-made air pollution. Despite this protection, many sources of man-made air pollution have the potential to affect the Tuxedni Wilderness, including oil and gas development in the Cook Inlet and long-range transport of air pollutants from other sources. The potential for increases in air pollution from the proposed project to impact the Tuxedni Wilderness and surrounding area should be addressed in the revised DEIS.

Wildlife Values

Chapter 4.23: Environmental Consequences

We recommend the USACE include additional information and discussion of the potential effects the project may have on wildlife, specifically birds, as detailed below:

- Please add additional details on the effects to waterbirds (seabirds, waterfowl, loons, shorebirds, etc.) from a spill event or water quality incident within the shipping lanes between the western and eastern coasts of the Cook Inlet. The analysis should consider a full range of the possible effects considering a variety of factors, such as weather and/or life cycle events of birds, particularly nesting or staging for migration.
- Please discuss how increased shipping traffic, or any future incremental increase, would increase the risks of water quality-spill incidents to the Cook Inlet islands/islets that may include the Barren Islands, a major seabird and sea lion use area (about 60 miles south of Anchor Point; about 75 miles southeast of the proposed Amakdedori Port or Diamond Point Port).
- Please add additional discussion of how new lighting for potential port facilities could prove disorienting for migratory seabirds or for daily foraging flights (Longcore and Rich 2004; Gaston et al. 2012; Rodriguez et al. 2017).
- Please use updated/current eagle survey data for the revised DEIS. Due to the lack of current eagle survey data (much of the eagle data for the project are 10 or more years old), the Service is unable to assess the full impact of project activities on bald and golden eagles; the Service considers eagle survey data to be accurate for 2 years following survey completion. The data that is available, although old, does indicate that bald and golden eagles are abundant throughout the proposed project area (including the area surrounding the mine site and the various transportation corridor alternatives), we believe there may likely be levels of disturbance, specifically during project construction but also during the operation and maintenance phases of the project, that would warrant a permit pursuant to the Bald and Golden Eagle Protection Act. The Service recommends the applicant coordinate with contacts at the Anchorage Fish and Wildlife Conservation Office to develop an appropriate survey protocol for the site (including timing and number of surveys needed, search area, and search techniques). The data collected from the new surveys would then be used to inform the eagle permitting process for the applicant and would help ensure the necessary permits. Permits are issued through our Migratory Bird Management program, and proper coordination during survey development helps ensure permits can be issued in a timely fashion.

Fish Values

The Service is concerned that the DEIS, as prepared, does not provide a complete or accurate analysis or disclosure of the project's potential impacts to the Bristol Bay fishery and associated fish resources from the proposed project. The DEIS should avoid subjective and qualitative language that creates a perception of minimizing the project's potential effects. As discussed in our comments for Chapter 4.27 Spill Risk, we recommend incorporating additional information and analysis of how a spill or tailings dam failure could impact fish in the Bristol Bay watershed into the revised DEIS.

The DEIS acknowledges that Iliamna Lake and its tributaries provide spawning and rearing habitat for all five species of Pacific salmon but fails to convey the enormous numbers of juvenile salmon that rear in the lake, or the importance of these fish to the Bristol Bay salmon fishery. Iliamna Lake is the primary Sockeye Salmon nursery lake for the Kvichak River system, where annual runs regularly exceed 10 million fish and are, on average, the largest among all of Bristol Bay's river systems (Erickson et al. 2018). After hatching, most of the Kvichak River's Sockeye Salmon spend one or two full years rearing in Iliamna Lake before migrating to the ocean; thus, on any given day, Iliamna Lake supports tens to hundreds of millions of Sockeye Salmon fry from three or more brood years. Given the complex age structure of Sockeye Salmon, even short-term impacts to rearing conditions in Iliamna Lake could affect salmon runs over multiple years. We recommend adding additional, clarifying information on the importance of Lake Iliamna to juvenile salmon and the Bristol Bay salmon fishery and incorporating it into the analysis of potential effects the project may have on these resources.

Because activities associated with the proposed project are expected to occur over an approximately 25-year period, the Service recommends including a discussion of predicted environmental changes over that timeframe and the potential additive impacts construction and operation of the proposed project could have on fish and their habitats. A large and growing body of research documents ongoing changes in aquatic habitats associated with global environmental change. For streams affected by the proposed mine, model projections through 2100 include greatly increased winter streamflow (including unprecedented high flow events), loss of high spring flows that typify the current hydrograph (due to decreasing winter snowpack), and increasing water temperature (Wobus et al. 2015). The fact that the DEIS does not account for such changes in hydrologic and thermal regimes, potentially invalidates the document's estimates of impacts to aquatic habitats and fish. For example, distributions of fish species and life stages within stream networks would likely change in response to these climatic shifts, potentially creating a situation where actual patterns of habitat use no longer align with those assessed in the DEIS. Additionally, the DEIS estimates changes in the extent of suitable spawning and rearing habitats for various species and life stages based on mine-related changes in streamflow (as measured by weighted usable area) without regard for the potential that mine-related impacts could be exacerbated by environmental-related changes in streamflow. Lastly, changing environmental conditions and projections should be considered when designing road culverts to avoid velocity barriers from increased winter streamflow, and changes in the timing of life history events should be considered when formulating timing windows to protect sensitive

life stages. These analyses are important components of analyzing the proposed project's cumulative effects.

Chapter 3.24: Affected Environment

- The Service recommends rewording text on Page 3.24-4, paragraph 1, "*Beaver ponds and other features are widely distributed in off-channel habitats...*" to reflect a more accurate description of the occurrence of beaver ponds and other off-channel habitats or, modifying the table contents to show spatial relationships of off-channel habitats to mainstem reaches. Table 3.24-1 does not present distribution information of beaver ponds and other features as suggested by the text. Beaver Pond and Other Off-Channel habitats within Table 3.24-1 are quantified as a relative composition of all off-Channel habitats occurring within the North Fork Koktuli (NFK), South Fork Koktuli (SFK), and Upper Talarik Creek (UTC) tributaries. There is no spatial reference to infer distribution of these habitat types within each of the tributaries.
- Figure 3.24-2 shows a tributary draining from the mine site and entering the NFK within Reach D. This occurs where the Main Water Management Pond is located. Table 3.24-1, footnote 1, identifies the Mine Site Analysis Area as "mileage from mainstem reaches adjacent to and downstream of the mine site and tributaries draining the mine site." Habitat type information is not included in the DEIS for Reach D. The Service recommends providing frequency of habitat type information within Table 3.24-1 for Reach D within the NFK, as this reach contains waters that are "adjacent to and downstream of the mine site and tributaries draining the mine site…"
- Please clarify if King Salmon exist within reach NFK-F. The pie chart depicting relative composition for reach NFK-F shows King Salmon comprising 4 percent of the fish species present. However, segments throughout reach NFK-F are highlighted as yellow (resident, non-anadromous salmonids) and green (non-salmonid fish).
- Please clarify the inconsistency within Figure 3.24-3, which shows two reaches within the SFK identified as SFK-D. The two reaches occur at River Mile 51.7 and 54.7. Table 3.24-1 includes habitat type information for a single reach identified as SFK-D. If reach SFK-E exists as suggested by Figure 3.24-3, modify Table 3.24-1 with habitat type values for consistency of information. If a single SFK-D exists, please modify Figure 3.24-3.

Chapter 4.24: Environmental Consequences

- In this DEIS section, short-term recovery is identified as less than 3 years, and long-term recovery is identified as less than 3 years to less than 20 years. Please clarify whether this was a typographical error or if there is a need to re-work these definitions.
- The DEIS quantifies habitat in terms of linear miles of stream/river. The use of a single linear measure does not take into account the relative value or importance of unique areas of the affected streams in terms of species-specific life stage requirements (e.g., spawning, rearing, overwintering). The Service recommends using a measure that quantifies area of habitat, categorized by species-specific life stage requirements, as a better metric of habitat availability and impact. Linear extent is a useful measure in some

instances, but it is an incomplete quantification of habitat without understanding an associated measure of area and oversimplifies and understates the total extent of habitat.

- The DEIS quantifies the loss of species-specific habitat (by life stage) and uses this value in calculating and reporting the percentage of loss among all anadromous habitats. This comparative approach is made at multiple spatial scales (e.g., local - NFK, SFK; and regional - Bristol Bay) throughout Section 4.24. Please note, anadromous habitat identified within the Anadromous Waters Catalog (AWC) does not necessarily support all life stages for all salmon. The DEIS understates habitat impacts by simply analyzing the proportion of total anadromous waters affected rather than considering habitat in terms of species-specific life stage requirements. The Service recommends describing permanently removed anadromous habitat in the context of species-specific life stage needs rather than generalizing to "all anadromous habitat."
- In summarizing the relative contribution Tributary 1.190 and 1.200 make to the total amount of anadromous habitat within the NFK, it is unclear if the USACE used the total amount of available anadromous habitat identified in the AWC or the total amount of habitat assigned to a species-specific life stage (spawning or rearing habitat). Discussing the importance of anadromous habitat without attributing this importance to a species-specific life stage could be misleading. For example, Page 4.24-5 states, "The 8.2 miles of anadromous habitat permanently removed within tributaries 1.190 and 1.200 represent 11 percent of the total documented 72.7 miles of anadromous habitat in the NFK River." It is unclear from the text what species and life stages would be impacted by removal of this habitat. Coho Salmon were found spawning and rearing in Tributary 1.190 as were rearing juvenile Chinook Salmon. Rearing juvenile Coho and Chinook Salmon, as well as other resident species, were found in Tributary 1.200. We recommend clarifying the species and life stages impacted by permanent removal of anadromous habitat.
- Table 4.24-3 does not appear to indicate changes in habitat quantity by stream reach, as referenced within the text. For example, Page 4.24-15 states, "Sockeye juvenile habitat increases would generally be associated with the SFK-C reach (Table 4.24-3)." Further, "The largest changes in habitat in the SFK area are associated with Rainbow Trout habitat, which increased in the SFK-C reach." If changes of species-specific life stage habitat quantities for pre-mine, operational, and post-closure conditions at the reach scale are known, inclusion of this information is essential for an understanding of the full scope of Environmental Consequences. The Service recommends including a table or discussion of these values at the stream reach spatial scale, for each of the waterbodies identified within the mine site (i.e., NFK, SFK, UTC).
- It is unclear how the DEIS incorporates and analyzes data on species-specific life stage habitat types. The DEIS states that changes in habitat for juvenile fishes would be reach-specific and is more dependent on reach-specific habitat features than the stream reach location within the river network. While this is generally true, it is unclear how "juvenile Coho Salmon habitat would alternate between increases and decreases in habitat within each reach (NFK-190, NFK=C, NFK-B, and NFK-A)." This same general assertion is made later as "However, in a downstream direction, reaches would alternate between habitat gains and losses for several species." The Service recommends clarifying and more clearly quantifying the assessment of Coho Salmon and Rainbow Trout habitat in terms of "alternating" between "increases and decreases," or "gains and losses" within

reaches occurring in a downstream manner; this clarification would provide better detail on the anticipated impacts of the project.

Threatened and Endangered Species

Chapter 3.25: Affected Environment

- The Service recommends revising the following sentence on Page 3.25-1, to more accurately describe the Endangered Species Act (ESA): "The ESA provides for conservation of fish, wildlife, and plant species considered to be at risk of extinction (threatened or endangered) in all or a substantial portion of their ranges; and to conserve the ecosystems and habitats on which they depend."
- Please note, the purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. The ESA is administered by the Service and the National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of the NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon. Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future.

Chapter 4.25: Environmental Consequences

We recommend the USACE include additional information and discussion of the potential effects the project may have on threatened and endangered species, as detailed below:

- Discussion on Page 4.25-3 states, "Impacts to TES [threatened and endangered species] would be minimized or mitigated by implementation of mitigation measures that would be developed through the permitting process, in consultation with the Service and the NMFS. Proposed mitigation measures are detailed in the specific biological assessments in Appendices G and H. The PLP's proposed mitigation incorporated into the project includes development of a WMP [Wildlife Management Plan]. The plan would be developed for the project prior to commencement of construction." We recommend prioritizing development of these measures, working cooperatively with the Service and the NMFS, then reanalyzing the project for its anticipated effects and impacts to listed species and appending this analysis to the revised DEIS. Please note, development of avoidance and minimization measures will also be essential to the ESA section 7 consultation(s).
- The DEIS states on Page 4.25-17, "although the western side of the Kamishak Bay has a high density of sea otters, they are fairly tolerant of vessel noise and would likely habituate to the regular presence of vessels at these locations." This statement is not supported; the Kamishak Bay sea otter population is not regularly subjected to the same type and level of disturbances as the Kachemak Bay sea otters (which are part of the stock that is not listed under the ESA). The Service believes sea otters found in the Kamishak Bay are more naïve and, thus, are likely to be more sensitive to disturbance

than those found elsewhere in the Cook Inlet. Please review this entire section and remove these types of unsupported statements that serve to minimize the proposed project's anticipated effects to listed species.

- The DEIS discusses projects impacts to sea otters in terms of "population-level" effects or impacts: 1) from Page 4.25-17, "...underwater or airborne noise on sea otters would be limited [to] the analysis area, and would not result in population-level effects…" and 2) from Page 4.25-18, "...these effects would be expected to be short term, limited to the immediate area of the port, and would have no population-level impact." The revised DEIS needs to analyze effects first on individual sea otters and then consider the resulting impact at the stock level, both for the MMPA and the ESA. Analysis of "population-level effects" or "population-level impacts" has the effect of minimizing the effects and impacts on individual sea otters from the listed population. The Service recommends simply identifying and analyzing the anticipated effects and impacts (i.e., harassment, injury, death) to listed sea otters that would result from construction and operation of the project.
- The DEIS discusses increased turbidity in the water column resulting from project construction as potentially limiting Steller's sea lion foraging ability (Page 4.25-16), but does not include a similar discussion for Northern sea otters. The Service recommends including a discussion of the project's potential to increase water turbidity and sedimentation on the seafloor in sea otter habitat, including critical habitat, and the resulting impacts on sea otters foraging in the area.

Appendix G: ESA Biological Assessment - USFWS

- At the time the DEIS was released, the USACE had not engaged the Service in consultation (either informal or formal) pursuant to section 7 of the ESA. Therefore, discussions of the ESA compliance are preliminary in nature. The Service conducted a cursory review of the draft biological assessment as part of our NEPA review of the DEIS; our comments should not be construed by the USACE, in whole or part, as a thorough review of the biological assessment, or as meeting their ESA section 7 consultation or the Marine Mammal Protection Act (MMPA) compliance requirements.
- The potential impacts and effects detailed in the DEIS and the draft biological assessment are not consistent. Several impacts listed in the DEIS are not analyzed in the biological assessment. For example, the DEIS lists increased vessel traffic from construction and operation of the project; the biological assessment only discusses increased vessel traffic from construction of the project. The DEIS discusses aircraft traffic to and from a newly constructed airstrip; the biological assessment does not mention aircraft traffic or an airstrip. In fact, the biological assessment, in general, appears to focus solely on effects to listed species from construction activities, with project operations (vessel traffic, lightering, aircraft, etc.) largely ignored. The Service recommends reviewing the DEIS and the biological assessment, and ensuring discussions about listed species are consistent. Additionally, the Service recommends including analysis and discussion of project operations into the biological assessment. Ensuring consistency in the analysis and discussion of impacts and effects to listed species between the two documents will ensure the project's potential impacts are fully disclosed, as well as facilitate the endangered species section 7 consultation(s).

- The draft biological assessment appears to dismiss effects to Steller's eiders by failing to address the potential effects from the proposed project's operational phase. The biological assessment contains numerous references to eiders not being affected because they would not be present in the summer months during construction activities. The Service recommends the USACE review the effects determination for Steller's eiders and reanalyze all phases of the project for potential effects to Steller's eiders.
- The biological assessment makes several unsupported and incorrect statements when discussing the project's potential effects on Northern sea otters and Steller's eiders. These include statements such as "hearing loss in sea otters is not a concern from the proposed continuous noise activities" (Page 15); "[n]oise harassment due to thruster use during pipeline construction does not rise to the level of take (and is discountable)" (Page 17); and "the amount of petroleum that could potentially be spilled during construction activities would be very small (a few gallons at most), and unlikely to lead to impairment of local sea otters" (Page 19). The DEIS should describe and analyze the impacts to listed species without making determinations as to what rises to the level of take. Through the section 7 consultation process, a determination will be made as to what effects constitute take under the ESA. The Service recommends review and revision of the biological assessment to more clearly and factually identify and analyze the anticipated effects to listed species and their critical habitat.
- The Service recommends including a more robust discussion of the pipeline installation in the biological assessment. Vessels that employ dynamic positioning during pipeline installation could have effects to sea otters from noise cavitation.
- Finally, the Service recommends the USACE revisit the analysis for listed Northern sea otters and their designated critical habitat in the draft biological assessment. Analysis contained in this document appears to minimize the potential effects the project may have on sea otters and their critical habitat. Based upon the available information, the Service does not agree with the conclusions drawn in the draft biological assessment for sea otters and sea otter critical habitat.

Appendix K 4.25: Threatened and Endangered Species

We recommend the USACE update descriptions of potential noise impacts resulting from the project and affecting marine mammals, including listed species, as detailed below:

- The numbers presented in Appendix K are for underwater sound only and do not address the above-water noise effects from aircraft. Sea otters spend a significant amount time with their heads above water and so, for aircraft noise, the airborne sound levels are just as relevant as the levels of sound below the surface of the water. Some aircraft at low altitude can produce sounds that would exceed the thresholds for acoustic disturbance. Additionally, it is likely there would be behavioral reactions at sound levels below the acoustic thresholds that could result in negative impacts to foraging success, and separation of females and dependent young. The Service recommends including these potential impacts in Appendix K and updating the discussion of potential impacts in the DEIS and biological assessment.
- Numbers quoted from Illingworth and Rodkin (2007) are accurately cited; however, the high end of the range quoted for impact pile driving, 210 decibels (dB) at 10 meters, was

for a 60-inch pile driven in less than 5 meters of water. The lack of water surrounding the pile would inhibit noise transmission into the water column, so this is not a truly representative noise measurement for a pile of this size; the same source level was reported for a much smaller (36-inch) pile in deeper water. The reported source level for the next-size-up pile in deeper water was 220 dB at 10 meters for a 96-inch pile, a number that should be included in the data presented in Appendix K. The transmission of sound underwater is such that a 10 dB difference in source level makes a difference in the distance from the source at which the MMPA Level B threshold is exceeded. The Service recommends updating the discussion of pile driving in Appendix K, taking water depth and pile size into consideration.

- Data from Ireland et al. (2016), Table 5.15 on Page 5-48, indicate the range of model-based curve source levels for dynamic positioning is 169 to 198 dB at 1 meter. Values from empirical curve models applied to measurements from vessels during the sound source characterization are 162.2, 191.7, and 200.0 dB at 1 meter. These are substantially higher levels than the vessel source levels reported in Appendix K. Although it is possible the suggested sound levels may be produced by some vessels operating under certain conditions, they do not represent the upper end (or, arguably, even the middle) of the range of sound levels generated during thruster use for dynamic positioning or the manipulation of barges and other vessels. Please update Appendix K to reflect the range of sound source levels likely to occur from dynamic positioning, as discussed in Ireland et al. (2016).

Spill Risk

Chapter 4.27 Environmental Consequences

Much of this chapter does not provide adequate data or analysis for the limited spill scenarios presented (with the exception of the Pyritic Tailings South Embankment Release scenario), or effects on the natural, economic, and cultural values of multiple downstream natural resources, particularly salmon. Throughout the chapter, effects are minimized or dismissed as not being "measurable," but no measurement types or measurable variability (as would be generated in a power analysis or detection limits) are given. Unless specific, measurable criteria indicating effects are provided, conclusions that there would be "no measurable effects" are speculative and do not allow the public, the USACE, the Service, or other regulatory agencies to evaluate the consequences of any spill scenario or distinguish among alternatives. These deficiencies should be addressed throughout the chapter. The Service recommends the USACE incorporate the following recommendations into the Spill Risk chapter and re-analyze the environmental consequences of the project as appropriate.

Section 4.27.2: Diesel Spills

- Overall, this section does not provide sufficient information to facilitate a comparison of the DEIS project alternatives with respect to the potential environmental consequences associated with oil spills. The magnitude/degree of potential impacts from the scenarios, including all affected natural resources, is not provided. Scenarios evaluated do not apply to all project alternatives. For example, a spill from a tug-barge collision was only

evaluated as occurring in the Kamishak Bay (Alternative 1), and the analysis may not be relevant to the same spill occurring under Alternatives 2 and 3.

- This Chapter identifies the "overfill of tanks" as a common cause of diesel spills but does not analyze the risk of such spills or the potential environmental consequences at all locations where overfilling of tanks could occur (e.g., filling of fuel storage tanks and International Organization for Standardization (ISO) containers at the Amakdedori/Diamond Point ports, and filling fuel tanks in the ferry on Lake Iliamna). No historical data on diesel spills from tank overfilling is described. There is a brief evaluation of spills that occur within a tank farm's secondary containment system, which presumed that all spilled fuel would be successfully contained within the secondary containment system. However, secondary containment systems are sometimes not successful in containing all released fuel, and notable fuel spills into the environment do occur from such overfilling events. In addition, filling of large tanks often requires that fuel is moved outside of a storage tank's secondary containment systems, providing another opportunity for diesel spills to the environment. We recommend the Chapter analyze the risk of "overfill of tanks" and the potential environmental consequences at the locations where overfilling of tanks could occur.
- This Chapter focuses on a relatively large diesel spill from marine tug-barge collision as the scenario for marine vessel incidents, although there are other potential vessel oil spill sources and scenarios that may have a higher probability of occurrence. Although a 300,000-gallon tug-barge collision spill would be catastrophic, diesel-hauling tug-barges are proposed to only be in operation 12 days per year, so the likelihood of any spill is relatively low. Conversely, handysize bulk carrier ships are proposed to be in operation 108 days per year to transport the concentrate, and the lightering vessels are proposed to be in use for 270 vessel traffic days. The risk of a vessel incident increases with increasing time in operation, and spills do not have to be "large" to cause severe environmental impacts. Handysize bulk carriers can carry several hundred thousand gallons of heavy fuel oil and a lesser amount of diesel for use in its propulsion. Bulk cargo ships are at an added risk of capsizing due to cargo liquefaction/instability. From Owl Ridge (2018c), "The risk of a moderate spill (10-1,000 gallons) is greatest for non-tank vessels [includes handysize bulk cargo ships] (1 spill in 579 years), followed by workboats (1 spill in 1,162 years), and tank barges which have the lowest risk (1 spill in 4,118 years)." We recommend the discussion in this Chapter be expanded to cover a full suite of potential vessel oil spill sources and scenarios.
- The Spill Risk assessment is inadequate for comparing differences between proposed sites because spill trajectory models were run for Amakdedori Port, but not for the Diamond Point Port or any of the lightering locations associated with either action alternative. The marine vessel scenario is based on tug-barge collision near the Amakdedori Port. If the scenario was associated with the Diamond Point Port, which can be considered more ecologically important in some aspects (e.g., seabird colonies, waterbird staging areas), the potential impacts could be larger than associated with the Amakdedori Port. Spill trajectory modeling was not performed for the Diamond Point Port, so it is unknown how a 300,000-gallon tug-barge collision spill at the two locations would compare. The tug-barge collision scenario provided does not facilitate a comparison of the three DEIS project alternatives. We recommend adding spill trajectory modeling for the Diamond Point Port so the differences in project alternatives can be

fully assessed; the currently included analysis does not allow resource agencies or the public to adequately evaluate the potential effects of spill occurrence(s) or to compare between alternatives.

- Spill response supplies should be staged at the Amakdedori/Diamond Point Port where offloading of double-hulled fuel barges would take place, in addition to the locations identified in this Chapter.
- The discussion of existing response capacity (i.e., for spills not large enough to bring in Alaska Chadux) mentions recovery procedures for on-land, marine, and shoreside environments. We recommend expanding the response capacity to include spills that occur at/on Lake Iliamna and in riverine environments, especially since tanker truck spills (an evaluated scenario in this Chapter) could affect one or more of these environments.
- The information contained in the Cook Inlet Maritime Risk Assessment (Glosten 2012) was primarily derived from incidents that occurred outside of the proposed study area and included all maritime activities, many of which were objectively less risky than the activities proposed in this DEIS. As such, the spill rate projections calculated from the baseline incident and vessel traffic data from the greater Cook Inlet Region do not adequately address the risks associated with the potential development of the Amakdedori/Diamond Point Ports. The Service recommends more fully acknowledging the Cook Inlet Maritime Risk Assessment's limitations in the DEIS and updating the analysis with more appropriate data.
- The baseline incident rates calculated for the Cook Inlet Maritime Risk Assessment were derived from the greater Cook Inlet Region where maritime activities are more routine along established shipping routes, which are less risky than the proposed Amakdedori/ Diamond Point Ports, with their shallow waters, rocky shoals, strong currents, and extreme tides. The potential discrepancy between the calculated baseline incident rates and potential actual incident rates that may occur as a result of the more extreme conditions in the project area should be disclosed.
- Incident data used in this assessment was primarily derived from areas where emergency tugs were able to respond to vessels in distress. The proposed Amakdedori/Diamond Point Port would occur in a much more remote and logistically challenging area, which is currently designated as a "no go zone" for emergency tugs. Without emergency assistance, the number and/or magnitude of potential incidents in the Amakdedori/ Diamond Point Port area would likely be greater than the baseline incident rates presented in the Spill Risk assessment, which were derived from Glosten (2012). This information should be disclosed. We recommend that each of the action alternatives incorporate emergency tug services to help mitigate the spill risk in this critically important area.
- Baseline incident rates derived from Glosten (2012) do not adequately represent the level of risk involved in activities proposed in this DEIS. Because Glosten (2012) did not focus on vessels involved in riskier activities, their incident rates are likely lower than what would be expected at the proposed Amakdedori/Diamond Point Port, where vessels would be required to moor at off-shore sites, conduct frequent lightering activities, and navigate to shallow port facilities often under adverse conditions. Statistically invalid inferences about spill risk are being made based on data that were collected outside of the proposed project area and from situations involving lower risk activities.

- Because activities at the Red Dog Mine are similar to the proposed activities in this DEIS, we recommend data from this site be incorporated into the risk assessment. The Red Dog Mine utilizes a shallow port with offshore mooring sites, lightering boats, and challenging conditions.
- Spillage projections (2015 to 2020) in the Cook Inlet Maritime Risk Assessment are based on the use of double-hull tankers, which are not being proposed in this DEIS. Spillage estimates for single-hull tankers are two to three times higher. We recommend that all fuel tank barges be double hulled. If this recommendation is not adopted, then the analysis should be reassessed based on the risks associated with use of single-hull barges.
- Glosten (2012) states, "risk is the product of probability and consequence." The most recent summary memorandum by Owl Ridge (2018c) does not attempt to address the consequences of a potential spill. Proposed port facilities would be constructed in areas where a spill would result in very high consequences. The Service recommends adding an analysis of consequences of a potential spill.
- Spill trajectory models indicate that 50th and 95th percentile spills would directly affect the Kamishak Bay and Lower Cook Inlet as far off as Kodiak Island, which would negatively impact many important populations of seabirds, shorebirds, and waterfowl, including thousands of federally threatened Steller's eiders, and many important populations of marine mammals, including federally threatened Northern sea otters.
- The Spill Risk assessment does not address spills along the proposed road corridors or the Iliamna Lake barge. We recommend that the Spill Risk assessment be expanded to address spills along the proposed road corridors and from the barge.
- The spill rate projections presented in the Spill Risk assessment for the Lower Cook Inlet Region contain high levels of variance, as they are based on limited data, approximations, and assumptions (Glosten 2012). Estimates for workboats in particular contain high level of error that have introduced additional uncertainty (Owl Ridge 2018c). Due to this uncertainty, the spill rate projections for workboats (i.e., lightering activities) and vessel traffic in the Lower Cook Inlet Region contain low levels of confidence. Low levels of confidence equate to high levels of uncertainty and, thus, high levels of risk. Given the potential catastrophic consequences of a 50th or 95th percentile spill in this area, we recommend integrating additional data on similar activities from appropriate sites (e.g., The Red Dog Mine) into this Spill Risk model to produce more statistically sound estimates that provide greater levels of confidence.

Tanker Truck Rollover

Several factors suggest that the evaluation of potential impacts from a tanker truck rollover is underestimated. Such factors are described below both generally and in specific detail as impacts related to specific trust resources.

- The risk of a tanker truck diesel spill was quantified using historic data from the Dalton Highway, on which trucks pull single, 10,000-gallon trailers. The proposed project intends to use a three-trailer configuration per truckload, with each trailer carrying 6,350 gallons (19,050 total). Physics suggests that longer and heavier tanker trucks are likely to require longer distances to stop and may be less stable in quick stop or quick turn

scenarios, such as would likely be needed to avoid an accident. These factors are not recognized in the discussion of the risk of tanker truck spills under the proposed project.

- The truck rollover scenario considers a 3,000-gallon spill, which is the "largest diesel spill volume reported on the Dalton Highway" where single trailer, 10,000-gallon trucks operate. Thus, the risk of a spill from a tanker truck rollover was related to the risk of damaging a single trailer. The 3,000-gallon scenario volume would represent roughly half of the volume of one of the proposed ISO containers in a proposed three-container truckload. Given the higher momentum of the heavier three-trailer configuration, it is possible that more than one ISO container could be compromised during a vehicle mishap. Therefore, the volume of a potential spill in this analysis is underestimated.
- The evaluation of potential impacts to natural resources uses subjective and qualitative language, which appears to minimize or dismiss the potential effects. Given the large number of stream crossings along the proposed transportation corridors, we recommend that the scenario evaluation include modeling of downstream fate and transport of spilled diesel in a typical stream, producing estimates of water column concentrations of diesel components throughout the extent of the potentially impacted stream, similar to the analyses done for the evaluation of tailings spills. This would allow other than qualitative evaluation of diesel spill impacts to aquatic natural resources, particularly fish. Such modeling would also provide support for (or against) several of the described potential impacts, which are currently dismissed without basis because "impacts would likely not be measurable."
- Toxic components of diesel can be entrained in the water column of turbulent water (e.g., wave action, stream riffles, and river rapids). We recommend that the impacts described to surface water, shallow sediments, and fish be expanded to account for entrainment.
- The scenario only considered ice-free and completely frozen stream conditions and fails to consider partially frozen scenarios or accidents that cause breaks in ice. We recommend that the scenario consider the possibility that a truck accident at a frozen stream crossing may break the ice and allow spilled diesel to travel downstream under ice, greatly complicating any response efforts and preventing evaporation of the volatile components into the air. Similarly, spilled diesel could enter a partially frozen stream, such as during the transition seasons between the ice-free and completely frozen conditions. The evaluation claims that diesel spilled onto frozen streams "would pool up" on top of the ice and would be relatively easy to remove; however, streams do not always freeze completely, making this assumption inaccurate.
- The scenario relies, in part, on the truck driver not being injured by the accident that caused the spill, so that the driver can report the spill immediately and begin to implement spill control activities. If the truck accident is serious enough to crack an ISO container, it is likely that the driver would be injured as well, delaying spill response.
- The discussion of potential impacts states that the "duration of impacts would likely be a few days to a few weeks" (for surface water) and "impacted vegetation may recover within one or two growing seasons" (for vegetated wetlands) without providing support for such conclusions. We recommend the analysis consider that impacts may indeed continue longer if soils along the banks of the waterbody are leaching spilled diesel or if spilled diesel is trapped under ice.
- The analysis states that groundwater would not be impacted because cleanup efforts would successfully remove all spilled diesel before it could percolate into the soil fast or

deep enough to contaminate groundwater, an assumption that may be true for some spills, but is not true in all scenarios (e.g., a large spill in an area with shallow groundwater).

- We recommend that the analysis consider the possibility of a tanker truck accident along the port access road for the Diamond Point Port under Alternatives 2 and 3, particularly the stretch along the shoreline of Iliamna Bay. Whereas tanker truck spills onto terrestrial habitats may have relatively localized effects, a spill into an inland stream or Kamishak Bay would rapidly spread on the water surface, would be harder to contain (if able to be contained at all), and would place relatively more natural resources (i.e., more species, higher numbers, and including threatened and endangered species) at risk of diesel exposure.
- The analysis of impacts to fish dismisses the ability of diesel to entrain into turbulent waters (e.g., at stream riffles), discounts the toxicity of diesel in the water column to fish, and overstates that most fish should be able to detect and avoid diesel contamination (see "Fish" section below for details.) The Service recommends the USACE revisit the analysis for project impacts to this important resource.

Water / Sediment / Groundwater Quality

- The analysis erroneously suggests that groundwater contamination, if it occurred, would not travel far from the site of the spill because "most aquifers in the project area are discrete and discontinuous." The groundwater hydrology in most of the areas along the transportation corridor has not been well studied, but Chapter 3.17 Groundwater Hydrology does indicate that the groundwater hydrology characteristics along the transportation corridor are likely similar to those found in and adjacent to the mine site. Additionally, the impact analysis found in Chapter 4.27.2.5 Scenario: Diesel Spill from Tanker Truck Rollover, Wildlife, states that a diesel spill in terrestrial environments would have "most of the diesel evaporating or seeping into the soil before being removed." Chapter 3.17 does not describe aquifers in the project area as "discrete and discontinuous" and instead suggests that shallow aquifers are present, groundwater contamination could travel ecologically relevant distances, and groundwater often discharges to surface water with "significant groundwater/surface water interactions." Groundwater contamination released to surface waters can be a hazard for fish and aquatic ecosystems.

Wetlands

- Vegetated wetlands are ecosystems composed of many natural resources in addition to vegetation. While the impacts of a diesel spill from a tanker rollover are discussed in the "Wildlife," "Birds," and "Fish" sections of the Tanker Rollover scenario, there is no consideration of the impacts to components of wetland ecosystems other than vegetation (e.g., aquatic and terrestrial invertebrates, which can form a major component of the food web in vegetated wetlands, and soil microorganisms).
- Plant mortality could result from the depletion of oxygen and micronutrients around the roots caused by the biodegradation of diesel by soil microorganisms. We recommend that the analysis of potential wetland vegetation impacts analyze this potential.

Wildlife

- In the analysis of impacts to terrestrial mammals, USFWS (2010) was referenced out of context. While the impact analysis spoke of terrestrial vegetation, the USFWS reference is relevant to marine plants.
- The analysis incorrectly dismisses the vulnerability of beaver and river otter to diesel spills. These animals rely on the integrity of their fur for warmth in cold aquatic environments, and diesel sheens on water can easily contaminate fur, creating risks of hypothermia and/or dermal absorption. Oiled fur also poses an ingestion risk as the animals try to groom the diesel out of their fur. Much is known about the effects of oil spills on sea otters, and this information would be largely relevant to beaver and river otter despite differences in marine and freshwater environments.
- The analysis does not mention the possibility of dermal absorption of diesel through direct exposure of Iliamna Lake seals to diesel spills that enter Iliamna Lake from a tanker truck spill in a tributary of the Lake, particularly before spill responders arrive on scene and effectively haze seals.

Birds

- The evaluation does not mention the risk of inhalation toxicity in birds. The Service recommends including an analysis of this risk in the revised DEIS.
- While the analysis is generally accurate for the impacts on non-rare birds from truck spills in terrestrial or inland stream/wetland environments, it did not recognize the relatively higher severity of impacts to birds from truck spills that may reach Kamishak Bay or Iliamna Bay. A truck spill into a stream that flows downstream to Kamishak Bay could affect relatively large numbers of rock sandpipers overwintering in the area and many other coastal/marine bird species likely present during the summer and migratory seasons. A truck spill into Iliamna Bay (e.g., from a truck sliding off the shoreline road) could also threaten relatively large numbers of coastal/marine birds as well as their prey in tidal mud flats and estuarine marshes. The Service recommends that the revised DEIS include these additional analyses.

Fish

- Reference cited as "NOAA 2006" is not available on the Pebble Project EIS website. Please provide access to this reference on the project website.
- The analysis does not recognize that diesel spilled into a typical stream within the project site is likely to be entrained into the water column via water turbulence (e.g., at stream riffles). We recommend the revised DEIS acknowledge and analyze this scenario.
- Components of diesel, when entrained into the water column, are known to be highly toxic, particularly to early life stages of fish, such as eggs and sac-fry. From NOAA (2018i) (as used in the DEIS): "In terms of toxicity to water-column organisms, diesel is considered to be one of the most acutely toxic oil types." Diesel exposure can cause sublethal effects such as decreased feeding rates, which can lead to the early demise of individuals (Gregg et al. 1997, Schein et al. 2009).

- While it has been found that a few species of fish (mostly fish adapted to highly variable estuarine environments) are able to detect and avoid diesel contamination in water or sediments, avoidance is only possible if: 1) fish are self-mobile and 2) there is clean habitat into which to retreat. Fish eggs and small/young fish that are not strong enough to navigate against stream currents would not be able to avoid diesel contamination. When spilled diesel is thoroughly mixed in the water column, the only safe habitat may be located upstream of the spill or in a clean tributary to the contaminated stream. A fish trying to avoid diesel is not likely to swim toward the spill source to reach the clean area upstream. A fish drifting or swimming downstream would not likely be able to outswim the movement of the diesel contamination downstream. The diesel contamination is not likely to resemble a bolus of diesel moving downstream; rather, the diesel is likely to be absorbed into or pooled along the stream banks, providing a source of leaching diesel for several days to weeks, depending on the success of response efforts, and prolonged exposure to diesel increases the risk of harm to fish.
- Modeling of diesel entrainment into the stream and diesel concentration dissipation as diesel moves downstream is necessary to effectively and meaningfully characterize the risk and the geographic extent of potential harm to fish from diesel spills into streams. We recommend that modeling to analyze and characterize the impacts from a diesel spill be done similar to the modeling that was done for the impacts analysis of tailings spills.
- The analysis does not evaluate the risk to fish from diesel spilled into waterways during the winter, when diesel may become trapped under ice either because the tanker truck accident cracked the ice or the waterbody was incompletely frozen over. Diesel trapped under ice cannot evaporate into the air, possibly increasing the toxic water-soluble concentrations under the ice. We recommend the revised DEIS include an evaluation of risk to fish from diesel spilled into waterways during the winter.

<u>Threatened and Endangered Species and Marine Mammals</u>

- The evaluation of a tanker truck diesel spill on species protected by the ESA and the MMPA erroneously focuses entirely on spills in terrestrial habitats only, despite the analysis of truck spills into streams done for other natural resource categories. A spill into a stream could discharge diesel into the marine environment. The evaluation also ignores the possibility of a tanker truck accident along the port access road for the Diamond Point port under Alternatives 2 and 3, particularly the stretch along the shoreline of Iliamna Bay. The analysis should evaluate the impact of a truck spill that discharged diesel onto the shoreline or into the marine waters of Iliamna Bay would have on Northern sea otters and Steller's eiders, in addition to other rare species.

<u>Commercial and Recreational Fishing</u>

- It may be true that a tanker truck diesel spill may not have significant long-term effects on recreational fishing, but the statement, "adult and juvenile fish are relatively mobile" and can avoid diesel spills (see comments for diesel spill fish impacts) is inaccurate and unsupported. While a diesel spill into a stream may significantly affect the fish populations in that stream (depending on the time of year) due to the high acute toxicity of diesel entrained into the water column, the stream receiving the spill is not likely to

comprise the majority of its watershed, and the clean portions of the watershed may continue to provide recreational fishing opportunities. Nearby unimpacted waterbodies may provide alternative recreational use sites. We recommend correcting the presentation of this information.

Marine Tanker Vessel Collision

- We recommend strengthening the discussion of mitigation-related design features of the marine tug-barges described in Section 4.27.2.4. For instance, marine radar is mentioned as a tool to be used to prevent collisions. Would state of the art technology be used (e.g., electronic chart display and information system or automatic identification system), which can enhance collision/collision prevention? See the first paragraph under "Design Features of Iliamna Lake Ferry" for examples of additional mitigation measures that should be applicable to tug-barges as well.
- We recommend that the tug-barge carry emergency tow gear.
- "Design Features of Marine Tug-Barges" should contain descriptions of the typical causes for tug-barge incidents, like is described for "Design Features of Iliamna Lake Ferry."
- We recommend that the revised DEIS identify whether the transportation of diesel to the Amakdedori/Diamond Point Port would occur through tug-barges owned and operated by PLP or through the contracted services of a fuel distribution company. If PLP intends to operate the tug-barges, additional description of PLP's mitigation measures regarding the safe operation of the vessel are warranted.
- The impact analysis accurately acknowledges that more than half of spilled diesel would evaporate relatively quickly, but we recommend that it also should acknowledge the environmental threat of the relatively more persistent components of diesel. For example, the impact analysis fails to describe the geographic extent of the area potentially impacted by a 300,000-gallon diesel spill (e.g., maximum expanse of sheen). The greater the geographic extent, the greater the likelihood that birds, marine mammals, threatened and endangered species, etc. would come in contact with the diesel. The spill trajectory modeling depicted in Owl Ridge (2018c) indicates that even a small spill (500 gallons) originating from near Augustine Island could have a significant portion (38 percent) travel more than 55 miles within 3 days to reach shorelines at Afognak Island.
- The spill response capacity for the tug-barge spill scenario does not describe wildlife capture and rehabilitation efforts (i.e., for birds, marine mammals, threatened and endangered species, and other animals). What would be the capability to capture and rehabilitate the various types of animals that are likely to be oiled during the 300,000-gallon spill scenario? What would be the capacity (e.g., how many Steller's eider may be held in rehabilitation facilities at one time)? We recommend providing these details in the revised DEIS.

<u>Water and Sediment Quality</u>

- The DEIS does not include discussion of impacts to shoreline/intertidal sediments from the portion of a 300,000-gallon diesel spill that persists to make landfall. Trajectory modeling (Owl Ridge 2018c) suggests that significant shoreline contamination is very

likely with a 300,000-gallon diesel spill. We recommend adding an analysis of discussion of the potential impacts to the shoreline/intertidal zone.

- The Spill Response capacity described for the 300,000-gallon tug-barge collision scenario did not include any shoreline cleanup. We recommend adding an analysis or discussion of shoreline cleanup in the tug-barge collision scenario.

Wildlife

- Terrestrial mammals that eat diesel-contaminated prey (live or carrion) may suffer sublethal effects of oil ingestion (e.g., hematological changes, organ damage) that could contribute to the animals' early demise (USEPA 1999, USFWS 2004, Patrick-Iwuanyanwu et al. 2010). These findings should be discussed in the DEIS.

Birds

- The description of the potential impacts of the tug-barge collision scenario on birds does not include any quantitative evaluation except for the rock sandpiper. Thus, it was not possible to evaluate the potential magnitude of the impact to birds. The current analysis seems to lack data on the numbers of birds of different species present in Kamishak Bay during different seasons; it also lacks trajectory modeling results that provide an idea of the geographic extent and duration of diesel in the environment for 3 or 4 days after the spill. We recommend generating quantitative estimates (e.g., total number of birds oiled) using realistic assumptions and identified caveats.
- The analysis uses qualitative, subjective, and unsupported language that appears to downplay the potential impacts to birds resulting from a 300,000-gallon tug-barge collision spill. For additional clarification, we provide the following comments and recommendations:
    - With respect to the analysis of potential bird impacts, it is irrelevant that "diesel is not very adhesive to substrates." Diesel can foul bird feathers as severely and as easily as crude oil, destroying the insulation and/or buoyancy that feathers provide coastal birds. From USFWS (2004b): "Light oils [e.g., diesel] leave a film on intertidal resources and have the potential to cause long-term contamination." Birds that use the intertidal zone to rest or forage can be exposed to these diesel residues.
    - The analysis states that "impacts from ULSD would have components similar to impacts from heavy oils, but at a reduced magnitude," suggesting the severity of the impact to birds would be less than for heavy oils; however, the analysis does not provide references to scientific literature to support such a claim. The presence of toxic diesel in the environment may be of shorter duration than heavy oils, but while diesel remains in the environment, the risk to birds (from physical fouling, acute toxicity, and sublethal toxicity) is probably very similar to that of heavy oil, given the presence of toxic polycyclic aromatic hydrocarbons in both. In addition, as was found with the 1996 North Cape oil spill, large spills of highly acutely toxic light oils in rough surf can destroy intertidal food sources for birds for at least 6 months, adversely affecting bird reproductive success (NOAA et al. 1999).

- Information on the effects of heavy oil on birds should not be characterized as representing "worst-case scenario." Severity of oil spills to birds relies more heavily on whether birds are present in the spill area and likely to come in contact with the spilled oil than on the oil type.
- The analysis references how "several hundred small diesel spills in Alaska…has resulted in few birds directly affected by diesel spills from fishing vessels," but goes on to mention that small spills in locations of high bird density can result in "more serious" impacts. In this analysis of a 300,000-gallon diesel spill scenario, the mention of the supposedly innocuous small spills is irrelevant, and we recommend that more discussion be provided regarding the scenario's potential impacts.
- "During most oil spills (which are generally heavier compared with diesel), seabirds are harmed and killed in greater numbers…" The phrase written in parentheses is not necessary, and its inclusion appears to be an attempt at minimizing the reader's perception of the potential impacts to birds, as if (incorrectly) the impacts discussed later in that paragraph are less likely to occur with a diesel spill.
- The analysis suggests that spill response actions for the 300,000-gallon spill scenario would be limited to the vicinity of the spill origination, and therefore bird disturbance would be limited to that area as well. We believe this is unsupported and inaccurate. Trajectory modeling (Owl Ridge 2018c) indicates that within 3 or 4 days a 300,000-gallon spill can travel over 50 miles, with as much as approximately 100,000 gallons either still floating on water or stranded on shorelines. Thus, response actions and bird disturbance could occur in a much larger area than just in the vicinity of the tug-barge. We recommend this analysis be corrected.

Fish

- This analysis for fish starts by pointing out that "floating diesel tends to evaporate...with no or very little visible sheen remaining within 3 days." This is not true of a 300,000-gallon diesel spill, as shown by the trajectory analysis and maps found in Owl Ridge 2018c. Therefore, we recommend removing this language.
- Impacts to important planktonic and weak-swimming nektonic organisms, such as tanner crab larvae and pacific herring eggs/larvae, are not mentioned. We recommend including impacts to these important organisms in the analysis.

Northern Sea Otter

- This section generally describes the susceptibility of sea otters to oil exposure and describes the factors that can affect the magnitude of impacts; however, this section does not describe the potential impacts that may result from 300,000-gallon diesel spill scenario.
- The statement that the "duration of direct impacts would be short (10 to 20 days)" is misleading. A 300,000-gallon spill in an area with high sea otter use (e.g., Kamishak Bay) could kill a significant number of sea otters, and this acute loss within the local

ecosystem could be felt for several years due to the demographic lag hindering recovery (Esler et al. 2018). The statement also fails to recognize the potential time it could take for sea otter prey to recover after being impacted by the 300,000-gallon spill. We recommend revising this section to more completely and accurately analyze and disclose the potential effects of a 300-gallon spill.

Steller's Eider

- The analysis appears to conclude that, despite the relatively high numbers of Steller's eiders in Kamishak Bay during some times of the year, a 300,000-gallon diesel spill originating in Kamishak Bay during the time of year when eiders are present would not "result in a large number of eider mortalities" because oil spill response efforts would be successful in capturing most/all of the oiled eiders and rehabilitating them. We believe this conclusion is unsupported and incorrect for the following reasons:
    - Searching for and finding live, oiled seabirds/seaducks is difficult and is never 100 percent effective. The manpower that would be needed to find and capture all of the oiled Steller's eider would be impractical.
    - Once they are discovered, capturing oiled seabirds/seaducks in the wild is difficult and usually only possible after the bird has been notably weakened by its exposure to the oil. Physiologically compromised birds such as this are not always able to be rehabilitated.
    - The successful rehabilitation of oiled seabirds/seaducks is reliant on the number of seabirds that rehabilitation facilities can handle at any one time. A 300,000-gallon diesel spill in Kamishak Bay during the time when Steller's eiders are present is not only likely to oil significant numbers of eiders but also significant numbers of several other bird species, all of which would be targets for capture and rehabilitation. A spill of this magnitude would likely overwhelm seabird rehabilitation facilities.
    - It would not be possible to focus capture and rehabilitation efforts for Steller's eider on just the eider that are the Alaska-breeding population, since they are indistinguishable while in Kamishak Bay.
- The statement that "most impacts would have a short duration (1 to 12 months)," is unsupported and incorrect and should be removed. While it may be true that diesel may cease to cause new environmental harm in 1 to 12 months, the impacts from a 300,000-gallon diesel spill on the Steller's eider of Kamishak Bay may last for several years until the impacted eider populations have recovered, similar to the Exxon Valdez harlequin ducks (Eisler et al. 2002).

Subsistence

- The analysis states that "impacts would last for a short period of time" without providing support for such a statement. We recommend providing a citation or additional support for this statement, or amending the statement to reflect a more likely scenario for the duration of potential impacts.

Ferry Incident

- The project proposes to place the diesel-hauling ISO tanks in a secondary containment system during transport via ferry. No description of this secondary containment system is provided, so the system's potential to prevent spills from the ISO tanks cannot be evaluated. The revised DEIS should describe the secondary containment system and analyze its impact on spill potential.
- In Section 4.27.2.4, ferry incident mitigation measures describe a propulsion system that can withstand 100 to 150 mph winds. We recommend developing a PLP ferry operations policy that prohibits ferry operations under certain extreme weather conditions.
- An analysis of impacts from a potential diesel spill associated with ferry operation was not performed because "a large-volume release of diesel from the Iliamna Lake ferries was considered to be so improbable as to have negligible risk." As recognized in Section 4.27.2.2, common causes of diesel spills in Alaska include overfilling of tanks. A spill associated with the refueling the ferries may be the type of ferry-related spill that has the highest probability of occurrence. A diesel spill does not have to involve a "large-volume release" to cause significant impacts to natural resources in the relatively enclosed Lake Iliamna. Therefore, an evaluation of the potential impacts from a diesel spill associated with refueling ferries is relevant and appropriate and should be conducted.

Fuel Storage Tanks / Tank Farms

- Section 4.27.2.4 does not describe mitigation measures (nor does Chapter 5) for preventing spills at tank farms, other than the use of secondary containment systems. This is inconsistent with the inclusion of discussion of design-based mitigation measures for the ferries even though ferry incidents are not being considered for an analysis of environmental consequences. Please include mitigation measures throughout the document as appropriate, for preventing spills at tank farms.
- As recognized in Section 4.27.2.2, common causes of diesel spills in Alaska include overfilling of tanks. These include large fuel storage tanks. Secondary containment systems are not always successful in containing the entirety of spilled fuel. We recommend the USACE include this risk in the DEIS analyses.

Section 4.27.3: Natural Gas Releases from Pipeline

- Section 4.27.3.1 should describe, at a minimum by simply listing, pipeline design and engineering features that would reduce the risk of pipeline rupture from seismic hazards (e.g., double-walled pipelines, leak monitoring systems).
- Section 4.27.3.2 inadequately describes the fate and behavior of released gas. We recommend this section include:
    - Information on the fate and behavior of leaked natural gas under ice. Such an event occurred in Cook Inlet in December 2016 from the Hilcorp pipeline gas release, which was a seafloor pipeline - as is the proposed project pipeline - that was damaged by a rock. Given the recent example of such an event, analysis of the potential effects is appropriate and should be added.

- Information on the solubility of methane in seawater at temperatures and salinities of Cook Inlet and Lake Iliamna. This would affect the rate and degree to which the gas would "rise buoyantly up to the surface" in the event of a leak.

Section 4.27.3.3: Spill Response

This section, as currently drafted, is incomplete and inadequate. Although true that the project applicant would be required to follow regulatory requirements for a natural gas spill response plan, the DEIS should at a minimum:

- Outline basic plan elements. Without spill response details, it is not possible to evaluate possible environmental consequences outside of a no-response scenario.
- Specifically discuss Cook Inlet and Lake Iliamna scenarios and consequences for release of gas under ice, as occurred in Cook Inlet in December 2016 from the Hilcorp pipeline gas release, which was a seafloor pipeline, as is the proposed project pipeline, which was damaged by a rock. Leaked natural gas from the referenced pipeline gas release accumulated under the ice and resulted in delayed repair of the pipeline, due to dangerous ice conditions and the presence of accumulated and potentially explosive methane bubbles under ice.

Sections 4.27.4 and 4.27.5: Concentrate Spills and Slurry Spills

These sections suffer from lack of specificity, in particular acknowledgement of highly variable water flows in the project area, and therefore minimize potential effects of concentrate and slurry spills. Because of the lack of existing response capacity (Page 4.27-39), the potentially "decades-long" effects of concentrate spills (from potentially acid-generating (PAG) and metal-leaching (ML) characteristics of ore concentrates, Page 4.27-33), the significant volumes (e.g., 2400 wet tons of copper-gold concentrate daily, Page 4.27-33) proposed for transport over multiple project areas and habitats, and the potential for transfer/lightering of ore concentrates, Sections 4.27.4 and 4.27.5 should be significantly expanded in scope and detail to fully inform the public and allow the project proponent, the USACE, the Service, and other regulatory and response agencies to fully evaluate the effects of concentrate spills to all Affected Environment categories and differentiate among the Alternatives. In particular:

- The timeframes for effects should explicitly incorporate seasonal and annual variation in water flow. Spills in low-flow seasons or years may results in less flushing of sediments and water from spills downstream than presented in the DEIS.
- Similarly, water flow variability should be explicitly incorporated into analyses for potential acid generation.
- More accurate acid-generation estimates, including explicitly incorporated water flow variability and high oxygen saturation in flowing waters (as acknowledged in the Tailings Spill section, Page 4.27-68), could determine whether acid generation from concentrate is greater than is accounted for in the DEIS.
- Increased acid generation can lead to increased metals leaching. Because these chemistries are co-located at a molecular level, (highly variable) water flows may not

"dilute" the acid before metals leaching occurs - there may be greater concentrations of metals leaching than is currently accounted for.

- Because acid generation and metals leaching occur over years to decades, so can the effects. This needs to be explicitly stated in concert with any time frame given for acid generation and metals leaching.
- Because there may be greater metals leaching than is currently stated, a full examination of toxic effects of metals on affected resources, particularly copper on salmon, should be included in this section (as it is in the Tailings Spills section).
- Please use correct terminology throughout the DEIS by changing "Acid Rock Drainage (ARD)," which implies a natural condition based solely on geology, to "Acid Mine Drainage (AMD)," which accurately describes acid generation due to mineral extraction activities (mining), from which all of the acid generation described in the DEIS would stem.

Section 4.27.4.1: Copper-Gold Concentrate

Additional information is necessary on the design of the concentrate shipping containers. Specifically, we request USACE provide additional details on the following:

- If a full, lidded container was to accidentally fall into marine waters during lightering to cargo ships, would the lid remain in place, preventing the discharge of mineral concentrate to the marine environment?
- Are the container lids strong enough to remain sealed in the event of a concentrate-hauling truck rollover?
- Verify that sufficient free space within a cargo hold *as it is being filled* would remain to allow the containers to be "lowered deep within the hold of the bulk vessel before being overturned, and the lids released" (Page 4.27-34).
- Bulk cargo ships, particularly those carrying mineral concentrate, are at an added risk of capsizing due to possible cargo liquefaction/instability. Proper distribution of concentrate into the cargo holds and preventing the exceedance of the maximum moisture content in the dry concentrate are important to ship stability. The DEIS does not demonstrate that the proposed method of tipping concentrate containers while lowered into the ship cargo hold would not incidentally increase the likelihood of capsize, which could result in the release of concentrate.

Section 4.27.4.3: Fate and Behavior of Spilled Concentrate

- The introductory paragraph notes that the fate and behavior of spilled concentrate occurs, "over the long-term, over several years to decades depending on conditions." We recommend listing those conditions (e.g., spill volume and the receiving environment - terrestrial or aquatic) and clarifying the impact of those conditions on the fate and behavior of spilled concentrate. The paragraph continues, "…spilled concentrates would have the potential to produce acid and leach metals into the environment," and the Service agrees with this statement. The introductory paragraph needs to acknowledge that the potential acid-generating and metals-leaching *effects* of a concentrate spill on

soils, waterbodies, vegetation, air quality, and the biological resources that depend on those, would also occur over the timespan of years to decades.

Section 4.27.4.4: Historical Data on Concentrate Spills/Spill Frequency and Volume

- The estimated risk of a concentrate truck rollover is based on data from the Red Dog Mine, which uses two trailers per truckload, and therefore may be an underestimate of the spill risk for the PLP project. The PLP project proposes to use three trailers per truckload. Heavier and longer truckloads, with their greater momentum, would be harder to control, and therefore the risk of a spill from three-trailer trucks may be higher. The DEIS should acknowledge the difference in the number of trailers per truckload and evaluate the related impact of that difference in spill frequency and volume.

Section 4.27.4.5: Existing Response Capacity

- There are very few details provided regarding the proposed spill response capacity or actions for concentrate spills. Spill response efforts can prevent or ameliorate environmental harm. Without spill response details, it is not possible to evaluate the potential for cleanup success or the possible environmental consequences outside of a worst-case (no response) scenario. Nevertheless, this Chapter's evaluation of potential impacts from concentrate spills often claims minimal environmental impact due to successful concentrate cleanup. We believe it is inaccurate to assume successful spill mitigation without the supporting details of a developed spill response plan. We recommend either supporting the assumption by providing details on the response plan or revising the analysis to reflect a no response scenario.

Section 4.27.4.7: Concentrate Spill Scenarios

- The revised DEIS should include an Impact Analysis for a concentrate spill from the Iliamna Lake ferry. Because the ferry is completely untested, it would be prudent to conduct this analysis.

Scenario: Concentrate Spill from a Truck Rollover

- Greens Creek Mine on Admiralty Island in southeast Alaska also trucks ore concentrate from the mine site to a port conveyor belt. Spill statistics from Greens Creek Mine should be mentioned and evaluated as a comparison.
- Amend the second paragraph to read, "A total of 80,000 pounds of concentrate is released onto roadside terrestrial or into aquatic habitats, including streams or rivers."
- The Spill Response description is accurate; a concentrate spill into a stream would be nearly impossible to clean up. However, the Potential Impacts section (beginning on Page 4.27-43) dismisses the likelihood of acid generation, metals leaching, and other effects from concentrate spilled into streams by assuming that spills would be cleaned up. These two conclusions are inconsistent and are carried throughout the Concentrate Spill section. Please revise the impact analysis to evaluate the most likely scenario that no spills are cleaned up.

- No quantitative modeling was performed for spilled concentrate fate and transport in "high-energy" (Page 4.27-43) streams (as was performed for tailings spills). Claims that stream flow would dilute any acid/metals sufficiently so that changes in water quality could not be measured are without support in the absence of modeling that specifically relates existing and predicted hydrological regimes (e.g., stream velocity and fluctuations from rainfall or runoff) to the proportion of concentrate that would be "flushed downstream." Further, concentrate may be deposited in stream areas that are intermittently wet as the stream water level fluctuates, and this would facilitate acid generation and metals leaching.
- The revised DEIS should evaluate the potential for a truck rollover to break through the ice, allowing spilled concentrate to enter the waterbody and increasing the difficulty of removing the spilled concentrate.
- Because final road design, including proposed grades, has not yet been determined, the differential probabilities of ore concentrate spills from truck rollovers among alternatives cannot be determined or evaluated. The revised DEIS should include an evaluation of a range of grades and associated spill probabilities.
- The first sentence of *Water and Sediment Quality* should be revised for clarification. If spilled concentrate does not enter surface water, then there would be no impacts to surface water quality. The second sentence in this section is not applicable; the DEIS acknowledges that no spill response capacity exists and provides no details as to how concentrate would be recovered "promptly and thoroughly." Therefore, the Service assumes that impacts would occur.
- Total Suspended Solids (TSS) and Turbidity: We recommend the analysis consider that impacts could actually occur over weeks to months to years, depending on seasonal and annual variation in stream flows.
- Acid Generation and Metals Leaching: The entirely descriptive analyses contained in this section are qualitative, subjective, and inadequate to inform the public, the USACE, the Service, and other regulatory agencies about the impacts of an ore concentrate spill or to evaluate differences among alternatives.
    - For example, subjective wording in the DEIS (Page 4.27-44) downplays the risks of acid generation, particularly in flowing waters. It is incorrect to say that acid generation would not occur under water, particularly under flowing water or lakes or ponds that have seasonal turnover, as these types of waterbodies have relatively high dissolved oxygen sufficient to generate acid, albeit not as quickly as in air. Further, the seasonal and annual water level fluctuations of streams and rivers in southwest Alaska may actually expose concentrate spills to air, which would also result in acid generation.
    - Similarly, metal leaching into water and subsequent bioavailability is dependent upon pH, alkalinity or conductivity, the valence state of metals in the ore, availability of non-biotic organic substrates, and other water quality variables, which are not mentioned or modeled in the DEIS for different types of receiving aquatic habitats.
    - Similarly, there is no analysis presented to support the conclusion that "fugitive dust would likely not have measurable impacts on water quality."
    - Please amend this section with robust modeling of the range of all site-specific impacts for TSS and turbidity, acid generation, metals leaching (from the mine

site and in the event of a concentrate spill), and fugitive dust from a concentrate spill on land.

- Under Air Quality, the assumption that spill response would result in no measurable impacts of fugitive dust is unclear. The subjective "prompt and thorough" qualitative description is unsupported by any spill response capacity or plans.
- The description of impacts under Wetlands and other Water/Special Aquatic Sites, and Vegetation is inadequate. There are no data nor any analyses to support the assertion that the concentrate would not affect wetlands through acid generation. There is no analysis to support the estimate of recovery time of several growing seasons for wetland vegetation recovery.
- Under Wildlife, there are no data or analyses to support the conclusion that a concentrate spill into a stream "would impact a small fraction of the total salmonid eggs in a stream," that there would be no measurable impacts on salmon populations, and that the duration of potential impacts would be "days to weeks" for wildlife and "will not extend longer than 1 year" for fish. The conclusions in the summary paragraph for this section (Page 4.27-46) are unsupported. Please either provide support for this conclusion or amend the conclusion.
- Under Fish, the Service disagrees that duration of impacts would not extend longer than 1 year (Page 4.27-47), as cleanup of a spill to aquatic habitats was previously acknowledged as being difficult or impossible to conduct. Therefore, impacts would likely occur over the years to decades during which acid generation and metals leaching would occur, or impacts would occur permanently via sediment "modification" of the benthic habitat that could significantly impair spawning habitat, depending upon the amount, thickness, and compaction of spilled concentrate as well as water flow. We recommend that the revised DEIS include a complete list of fish habitats that may be affected by an unrecoverable in-water concentrate spill (e.g., salmon spawning, rearing, and feeding habitats; and resident freshwater and marine fish habitats in rivers, streams, wetlands, Iliamna Lake, and Cook Inlet).
- While the Service agrees there would be no measurable toxicity impacts to fish from metals if the spill is promptly removed, the DEIS previously acknowledges concentrate spill cleanup in water as being difficult or impossible to conduct. Therefore, impacts would likely occur. In particular, copper is highly toxic to fish. Given the ecological, economic, and cultural importance of salmon in the project area, we recommend that the DEIS thoroughly explain and analyze the potential effects of copper and other potentially leached metals from an unrecoverable concentrate spill to fish in this section, similar to the explanation of toxicity in the Tailings Spill section, including:
    - Clear and thorough explanations of the potential toxic effects of copper and other metals to fish, such as those cited in the Pyritic Tailings Spill scenario (e.g., for fish, Page 4.27-107).
    - Clear and thorough discussions of chemical factors affecting toxicity (e.g., valence state, pH - which may be lowered in the vicinity of the acid-generating concentrate, and concentration of dissolved and particulate organic carbon; and buffering capacity, which is variable across the project area (Appendix K3.18)).
    - Commonly accepted and scientifically sound modeling to predict bioavailable copper concentrations in water and fish from an unrecovered concentrate spill

(e.g., U.S. Environmental Protection Agency's Biotic Ligand Model) in streams, lakes, wetlands, Lake Iliamna, and Cook Inlet.

- The DEIS should not assume that a concentrate spill on ice would be recovered, as even one container or bag of concentrate would weigh many tons and could easily break through the ice. We recommend that the revised DEIS examine the potential for such an incident to occur as informed by an assessment of Alaska trucking accidents where trucks or cargo have gone through ice.
- We recommend that the DEIS acknowledge the potential for cumulative effects from single and multiple unrecoverable concentrate spills into water over the approximately 25-year life of the project, including the potential for impacts to salmon populations plus the ecosystem elements that rely on them for nutrients (e.g., marine-derived nutrients), food (e.g., bears, humans), and economic benefits (e.g., commercial and recreational fishing). For example, under Commercial and Recreational Fishing (Page 4.27-49), the DEIS first states that a spill could smother salmon eggs, but because it may occur upstream of commercial salmon locations, there would be no impact. This conclusion is logically inconsistent, as fish eggs become adult (harvestable) fish.
- Under Subsistence (Page 4.27-50), the DEIS minimizes impacts by assuming that a concentrate spill would be cleaned up.

Scenario: Concentrate Slurry Spill from a Pipeline Rupture

- If an earthquake is severe enough to cause a pipeline rupture (Page 4.27-50), it may also damage the automated leak detection system and the isolation valves. Please amend the scenario to include a range of possible volumes of lost slurry to account for this possibility.
- Non-specific Best management Practices (BMPs) are mentioned under Spill Response (Page 4.27-51). Please provide information on these BMPs and how their implementation would minimize impacts from spills.
- The Potential Impacts to Water and Sediment Quality section (beginning Page 4.27-52) is incomplete, similar to the same section for the truck rollover concentrate spill scenario. In particular:
    - TSS and Turbidity: Please remove the statement beginning, "With effective cleanup…."
    - Sedimentation: Concentrate slurry that filled in "void spaces between gravel glasts" would permanently, not temporarily, impact salmon habitat.
    - Acid Generation and Metals Leaching: Please refer to our comments for the same sections under the truck rollover scenario and our comment regarding non-specific BMPs reducing erosion.
- There are no data or analyses to support the conclusion that "there would be no measurable impacts to air quality" from fugitive dust from dried slurry (Page 4.27-54, under Air Quality). Please either add data and analysis or remove the conclusion.
- The description of impacts under Wetlands and other Water/Special Aquatic Sites, and Vegetation (Page 4.27-54) is inadequate. There are no data nor any analyses to support the assertion that the concentrate would not affect wetlands through acid generation. There is no analysis to support the estimate of recovery time of several growing seasons for wetland vegetation recovery.

- The conclusions based on the minimized area of impacted Wildlife for the proposed scenario would not apply to larger spills.
- Our comments under Fish, Commercial and Recreational Fishing, and Subsistence for the concentrate spill scenario apply to the slurry spill scenario; the Service believes that impacts are likely. Given the ecological, economic, and cultural importance of salmon in the project area, the DEIS should thoroughly explain and analyze the potential effects of copper and other potentially leached metals from an unrecoverable concentrate slurry spill to fish and the ecosystem, commercial, recreational, and subsistence activities and values that those fish support.

Section 4.27.4.10

- Please include an Impact Analysis for Section 4.27.4.10 Iliamna Lake Ferry Rupture. Impacts to benthic habitats would occur in the event of a spill from this vessel, which has yet to be designed, built, or tested.

Section 4.27.5

- Please include an Impact Analysis for Section 4.27.5, Reagent Spills. Although relative spill probability is low due to lower volume and hazmat shipping methods used for reagents, the acute toxicity to fish and aquatic life, the hazards to responders and wildlife in the vicinity of a spill, and the lack of existing spill response capacity as noted in Section 4.27.5.3 mean that any reagent spill would have measurable impacts.

Section 4.27.6: Tailings Release

- We appreciate the specificity and analyses that were conducted to inform this section.

Section 4.27.6.3: Fate and Behavior of Released Tailings

- Under "2. Types of Tailings," please amend last sentence to read, "...bulk and pyritic tailings would cause elevated TSS, turbidity, sedimentation, and metals concentrations if released…"
- Under "3. Water Content within the TSF," please remove the imprecise and unnecessary phrase, "not capable of flowing great distances." The previous sentence describes the viscosity, and the following sentence describes modeling results.
- Under Tailings Fluid Release, we do not believe the modeled result is accurate, which assumes that released fluids would be immediately diluted by stream water, especially in the case of large-volume release into smaller headwater streams. Please remove this phrase.
- Under Tailings Solids Release, please amend the last sentence to read, "... downstream sedimentation, elevated TSS/turbidity, and elevated metals concentrations..."
- Under Acid, Tailings Solids, please amend the first paragraph to acknowledge the reality that tailings in aquatic environments are difficult to clean up, by amending the last sentence to read, "Acid would be generated in amounts inversely proportional to tailing recovered."

- Under Metals, Tailings Solids, please acknowledge the reality that tailings in aquatic environments are difficult to clean up by removing the second sentence of the first paragraph, which reads, "However, timely and effective recovery of spilled tailings would prevent such impacts."
- Under Metals, Tailings Solids, no data or analyses are presented to support the conclusion that "no single body of water would likely become acidic enough to accelerate ML from spilled tailings." The revised DEIS should either provide data to support this conclusion or change the conclusion.

Section 4.27.6.9: Tailings Release Scenarios, Bulk Tailings Delivery Pipeline Rupture

- Under Metals Contamination**,** please define "measurable metals," especially as ML may be accelerated by acid generation.
- Under Water and Sediment Quality, Surface Water Quality, TSS (Page 4.27-82), please amend the last sentence to include a more realistic timeframe based on the difficulty of cleanup: "....after that for weeks to months to years…"
- Under Water and Sediment Quality, Surface Water Quality, Metals (Page 4.27-85), please amend the timeframe for metals leaching into the water to include acceleration from acid generation.
- Under Wildlife (Page 4.27.87), we recommend amending the last sentence of the first paragraph to include the possibility of tailings spilled through ice or during broken-ice periods, which would be nearly impossible to clean up.
- Under Wildlife, please add at the end of the second paragraph, "Moose may forage on vegetation that regrows or is planted on tailings; willows in particular preferentially accumulate metals (Ohlson and Staaland 2001)."
- Under Wildlife, please amend the third paragraph to say that tailings may eliminate, not "reduce the quality of," spawning habitat. We disagree that no population-level impacts may be anticipated from the proposed scenario; we anticipate that permanent alteration of salmon spawning areas from difficult-to-clean-up tailings, or from the excavation of streambeds required to clean up tailing spills, would indeed impact NFK salmon populations.
- Under Fish (Page 4.27.89), we disagree that the duration of impacts on salmon would be limited to 1 year (see previous comment).
- Under Fish, we disagree that "any acid produced would be diluted…and reduction in pH would not be measurable," even for this specific scenario. This would be entirely dependent upon the volume of tailings spilled in water and the water flow regime.
- Under Fish, the conclusion that even a small amount of tailings would not result in measurable toxic and bioaccumulative effects due to metals leaching is not supported by data or analysis.
- We appreciate the toxicity testing (Nautilus Environmental 2012) undertaken in support of the PLP project. However, the testing is insufficient to determine anything besides relatively gross effects on survival in salmonids and growth and survival in an unrelated fish (i.e., fathead minnow) that is a well-used test species, but is not present in the project area. The toxicology literature is replete with salmonid-specific studies on the toxicity of all the metals in the PLP ore to multiple life stages and species. Given the importance of salmon in the Bristol Bay watershed, the DEIS should at a minimum include a thorough

literature review and assessment of sub-lethal, developmental, chronic, and acute effects, including mortality.

- Further, we disagree that long-term persistent population-level impacts to fish would not occur; see our previous comments and notations within the DEIS regarding the inability to clean up fine tailings from aquatic environments.
- Under Marine Mammals, we agree that salmon prey of marine mammals may be reduced and request acknowledgement of the same effect for terrestrial wildlife and human consumers.

Section 4.27.7.9: Potential Impacts of Contact Water Release from the Main WMP [Water Management Pond]

- The Service appreciates the specificity and accuracy of the effects to wildlife and fish outlined in this scenario. On Page 4.27-123, please note that swans were poisoned by lead from sediment and grass ingestion (Blus et al. 1991), and raptors were exposed to lead (Henny et al. 1994) 30 to 40 years after mining operations at the Coeur d'Alene River mining site from ingestion of sediments and grass contaminated with lead; zinc and lead poisoning also occurred in wild birds from the Tri-State (Oklahoma, Kansas, and Missouri) Mining District (Beyer et al. 2004). We recommend the revised DEIS include these as relevant comparisons for estimating effects in the event of a PLP tailings or contact water spill.

Chapter 5: Mitigation

- The Service provides the following comments and recommendations to address mitigation of Diesel Spills:
    - Mitigation measures that would assist in preventing diesel spills only describe three structural design measures (i.e., the use of double-hulled fuel barges, secondary containment systems, and ISO containers); no operational measures are described. Notably lacking in this Chapter, as well as in Chapter 4.27.2, is a description of the precautionary operational measures that would be taken during offloading of the double-hulled fuel barges at the Amakdedori/Diamond Point Ports. For instance, because fuel barge offloading is proposed to occur only four times per year, what measures would be taken to ensure that personnel are adequately trained and experienced (not "rusty") in port-specific fuel offloading procedures?
    - We recommend consideration of an automated tracking system for trucks hauling oil or hazardous materials to facilitate the identification of truck accidents and expedite response activities.
    - Additional comments on mitigation measures related to diesel spills are provided in association with our Chapter 4.27.2 comments above.
    - We recommend adding a description of operational measures that would be employed to reduce spill risk and to respond to spill events.
    - If no operational measures are proposed, then the analysis of spill risk and spill fate in the DEIS should factor in the increased probability of accidental spills and the resulting environmental consequences.

- Table 5-1: Terminology Used in the EIS - The Service recommends the DEIS analyze agency suggested mitigation. Table 5-1 states agency suggested mitigation measure are not considered part of the proposed project and are not considered in the impact assessments in Chapter 4, Environmental Consequences. However, according to the CEQ in the NEPA Regulations and Appropriate Use of Mitigation Memo (40 CFR 1502.16(h), CEQ 2011), an EIS must contain analysis of environmental consequences of the action, alternatives, and the means to mitigate adverse environmental effects.
- Section 5.2.1.2 Best Management Practices - The description of the BMPs that would be utilized to prevent and manage invasive species is insufficient. There are a wide array of BMPs that are used by industry, and they vary greatly in effectiveness and across the environments. Based on the information provided, a reviewer cannot adequately judge the merits of the techniques the project would use. We recommend adding detailed descriptions of the proposed measures or providing references for proposed BMPs for plants (aquatic and terrestrial), vertebrates, invertebrates, and marine organisms.
- Table 5-2, Page 5-9: We recommend adding discussion/recognition of marine invasive species that may be introduced through the marine port and lightering activities.
- The DEIS refers to the 27 plans (listed below) that may contain measures to avoid and minimize potential impacts of the proposed project, but were not available for review and comment when the DEIS was published:
    - Adaptive Management Plan
    - Aquatic Resources Monitoring Plan (ARMP)
    - Blasting Plan
    - Compensatory Mitigation Plan (CMP)
    - Construction Plan
    - Cultural Resources Management Plan (CRMP)
    - Emergency Action Plan
    - Erosion and Sediment Control Plan (ECSCP)
    - Facility Response Plans (FRPs)
    - Fugitive Dust Control Plan (FDCP)
    - Horizontal Directional Drilling Plan (HDDP)
    - Integrated Waste Management Plan (IWMP)
    - Long Term Management Plan
    - Maintenance Plan
    - Noise Monitoring and Mitigation Plan
    - Marine Mammal Monitoring and Mitigation Plan
    - Mitigation Work Plan
    - Oil Discharge Prevention and Contingency Plans (ODPCPs)
    - Project Communications Plan (PCP)
    - Reclamation and Closure Plan (RCP)
    - Restoration Plan
    - Sediment Control Plan
    - Sewage Treatment Plan
    - Spill Prevention, Control and Countermeasure (SPCC) Plans
    - Storm-Water Pollution Prevention Plan (SWPPP)
    - Tailings Storage Management Plan
    - Wildlife Management Plan

- In the absence of these proposed plans, evaluating the project's impacts on resources is difficult. For example, in reference to the Wildlife Management Plan (Page 4.32-3.), the DEIS states that the proposed mitigation includes development of a Wildlife Management Plan, and the Wildlife Management Plan would be developed for the project prior to commencement of construction, would use best management practices, and would describe techniques that would be used to minimize the potential for wildlife interaction with project activities and to minimize impacts to wildlife in the project area. It is clear that a Wildlife Management Plan has not yet been developed; therefore, the means to mitigate effects to wildlife have not been developed and are not analyzed in the DEIS.
- Absent details on the proposed management plans, the public, the USACE, the Service, and other resource agencies cannot adequately analyze the ability of these plans to avoid, minimize, or mitigate the effects of the proposed action. Absent these details, the analysis included in the DEIS should not assume successful avoidance, minimization, or mitigation. Impacts should be analyzed and disclosed in accordance within this context. Therefore, we recommend that drafts of the plans listed above be appended to the revised DEIS.
- We recommend including the Service's Recommended Mitigation Measures (Enclosure 3) in the Wildlife Management Plan that is under development to avoid and reduce direct, indirect, and cumulative effects from project related impacts on fish, wildlife, habitat, and subsistence resources.
- The Service is available to provide technical assistance in developing the various management and mitigation plans. We also request an opportunity to review and comment on the adequacy of the plans in avoiding, minimizing, and mitigating effects to our trust resources.

Appendix E: Laws, Permits, Approvals, and Consultations Required

The Service recommends this appendix provide additional clarity on laws and regulations related to the control and spread of noxious weeds, including for the following:

- Please note, Executive Order (EO) 13751 amended EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. EO 13751 applies to the USACE as well as other listed federal agencies. The EO states that federal agencies should refrain from authorizing "actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

  Additional language related to the proposed project includes: Sec. 3. Federal Agency Duties. Section 2 of EO 13112 is amended to read as follows:

  1. "Sec. 2. Federal Agency Duties. (a) Each Federal agency for which that agency's actions may affect the introduction, establishment, or spread of invasive species shall, to the extent practicable and permitted by law, (1)

identify such agency actions; (2) subject to the availability of appropriations, and within administrative, budgetary, and jurisdictional limits, use relevant agency programs and authorities to: (i) prevent the introduction, establishment, and spread of invasive species; (ii) detect and respond rapidly to eradicate or control populations of invasive species in a manner that is cost-effective and minimizes human, animal, plant, and environmental health risks; (iii) monitor invasive species populations accurately and reliably; (iv) provide for the restoration of native species, ecosystems, and other assets that have been impacted by invasive species; (v) conduct research on invasive species and develop and apply technologies to prevent their introduction, and provide for environmentally sound methods of eradication and control of invasive species; (vi) promote public education and action on invasive species, their pathways, and ways to address them, with an emphasis on prevention, and early detection and rapid response; (vii) assess and strengthen, as appropriate, policy and regulatory frameworks pertaining to the prevention, eradication, and control of invasive species and address regulatory gaps, inconsistencies, and conflicts; (viii) coordinate with and complement similar efforts of States, territories, federally recognized American Indian tribes, Alaska Native Corporations, Native Hawaiians, local governments, nongovernmental organizations, and the private sector; and (ix) in consultation with the Department of State and with other agencies as appropriate, coordinate with foreign governments to prevent the movement and minimize the impacts of invasive species; i) and (3) refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

- We recommend that the USACE add additional clarifying information on the National Invasive Species Act (NISA) of 1996, which amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. The 1990 Act established the Aquatic Nuisance Species (ANS) Task Force to coordinate nationwide ANS activities. The ANS Task Force is co-chaired by the Service's Assistant Director for Fisheries and Habitat Conservation and the Undersecretary of Commerce/NOAA. The USACE is one of the federal members to the ANS Task Force. Activities related to the proposed project that members of the ANS Task Force are charged with include: preventing the introduction and dispersal of ANS and monitoring/controlling ANS. The NISA furthered ANS activities by calling for ballast water regulations.

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1	**Sectn**	**Page**	**Parag**	**Original Text**	**Suggested Text**	**Comment**	**Additional References**
2	1.5	1-4	All	The USACE has determined that the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand.	The USACE has determined that the overall project purpose is to evaluate whether to develop and operate a copper, gold, and molybdenum mine in Alaska, if needed to meet current and future demand, and if so, how to do so in a way that reflects the public interest in economic development broadly, while meeting USACE mandates to protect water resources.	The purpose is overly narrow, adopting the applicant's purpose for the project while silent on the agency's purpose and the public interest. The needs and goals of the parties involved in the application or permit may be described as background information. However, it is the agency's purpose and need for action that will determine the range of alternatives and provide a basis for the selection of an alternative in a decision. The purpose should perhaps be to evaluate whether to develop and operate a mine in Alaska, consistent with USACE mandates to protect water quality, wetlands, etc. (CWA 404(b)(1)). Currently, USACE's mandate to protect water quality is not mentioned, only one mining site is considered, and the public interest is only defined by the economic benefits of mining, not the economic benefits of preserving the area - including the economic benefits to commercial fisheries. As currently defined, an alternative recognizing that existing mining is sufficient to meet demand could not be included in the range of alternatives.	
3	2.2	2-2	All			Section 1.5 states that "The USACE has determined that the applicant's stated purpose is made too narrow by limiting the proposed development to the Pebble deposit." However, no alternative is considered for mining sites outside of the Pebble deposit, aside from the no action alternative.	
4	2.2	2.1			Alternative descriptions, table 2.1, and figure 2.1 should be amended to reflect vessel routes in Cook Inlet to and from port sites.	Alternatives do not identify vessel routes to and from the Amakdedori Port Facilities site. While the document indicates some rocky outcrops, they are extensive in the area, and can be seen on NOAA nautical charts. Without further identification of the routes it is impossible to determine the potential risk associated with navigating to and from the Amakdedori port site facilities. This is a crucial component of the development process, as knowing intended approach and departure routes of vessels is also crucial to fully evaluating the potential impact of a proposed project, and where risks to coastal resources may be indicated. This is particularly concerning as some of the reef environments adjacent to Katmai National Park, are extensive and at low tides can extend several kilometers from the coast.	
5	2.2.2 Action Alternative 1 – Applicant's Proposed Preferred Alternative and App. N pg 3	Preferred alternative and App. N pg 3	See preferred alternative	"UPDATES TO THE PROJECT DESCRIPTION" ... 3. The pyritic tailings (and PAG waste rock) would now be placed into the pit lake (i.e., the water that would accumulate in the open pit as a lake at closure).		Section needs further justification. This alternative does not appear viable from either a mining or environmental standpoint (based on Gaffari et al 2011; Chambers 2019, review of US and Canadian Cu mining practices, and attached references). Rendering approximately 88% of a world-class metals resource inaccessible by burying it under acidic waste and more than a million tons of waste rock in the pit, is unlikely and unprecedented. Proposal is likely to avoid managing wastewater at the lined pyritic waste TSF into perpetuity. Recommend providing empirical evidence that the remainder of the ore body would not be "sterilized" (Chambers 2019) by this alternative, provide evidence that the pit can and will actually contain the highly acidic metal laden waste into perpetuity from area waterways. See comments and attached references particularly vendor studies by Smith and Cathcart 2008. Returning PAG tailings and waste rock to the pit after mining just 12% of a known resource (Ghaffari et al. 2011) is an unprecedented scenario for a preferred mine alternative, particularly since the majority (88%) of the ore can be rendered un-mineable afterward (Chambers 2019). Proposed perpetual storage of highly acidic, metal laden water in the pit is problematic from an environmental standpoint, because: soil layers in the region are highly conductive; aquifers under and near the pit supply area waterways; groundwater connections are documented between Nushagak and Kvichak watersheds (Smith and Cathcart 2008 attached); geologic faults at the site remain undocumented; bedrock fractures are known to occur. Such conditions raise questions as to whether the pit is the best perpetual storage site for the highly toxic pyritic waste stream. How would contaminated water from the pit be prevented from migrating to groundwater and area waterways? How and why would this alternative be better environmentally versus storing and treating the PAG waste in a lined impermeable system perpetually?	
6	2.2.2.2	2-60	closure	road system would be retained as long as required		This statement conflicts with 4.9.2.2, page 4.9-5, paragraph 2. It seems much more probable that this road system will be abandoned in place for the associated villages to choose to maintain or use. If the road system is likely to be a change that persists into the future, the impacts of that road system should be evaluated in terms of that longer term reality.	
7	2.2.2.2	2-59	3	a pioneer road would be established		The plan does not specify the location of origin for materials to initiate the road system prior to development of the first material site. If any material is to be brought from off-site, it is important that the mechanism to ensure the material is free of invasives is considered and reviewed.	

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8	2.2.2.3	2-66	3	all		The statement is that the beachhead and permanent port site airstrip would be established during the initial construction effort. This construction would be accomplished prior to any access to material sites, but there is no indication of where the material would come from to establish this airstrip. Invasive plants are usually transported into projects like this either on the heavy equipment, or in bulk materials used to establish such sites. The specific plan for where this material is coming from, and if it originates off-site, how it would be ensured to be free of invasive plants, should be addressed in the document.	
9	3.1.4	3.1-6, 1-7	All			USACE obtained relevant TEK from scoping comments, the EPA Watershed Assessment, the Pebble Environmental Baseline Document chapter on Subsistence (if it can be attributed to an individual or organization) and meeting notes from government to government meetings. Among other items, they were especially interested in information on surface and groundwater hydrology and water quality; natural hazards such as avalanches and rockslides, observations of trends, patterns, or changes in weather and climate; and information on fish, wildlife, birds and marine mammals, including distribution, seasonal presence, population trends, migration patterns, habitat areas, behavior, and changes over time; and culturally important areas in the project area from a historic and contemporary perspective. The EIS sees TEK as a body of knowledge about climate, landscapes, and subsistence resources, and including a historical perspective, but this characterization does not capture its cultural significance. Because TEK is an accumulation of data acquired over thousands of years, the depth and breadth of this knowledge is vast. Comments compiled from public meetings and consultations do not adequately document TEK.	
10	3.2.2.5	3.2-15	4	The National Park Service manages…. These transportation corridor and mine site components would occur in the vicinity of, but not on, these lands. These project components would therefore not be subject to the NPS's land management jurisdiction.	These transportation corridor and mine site components would occur in the vicinity of, but not on, these lands. However, as a major conservation stakeholder in the immediate vicinity, NPS is concerned about impacts to its managed resources from contaminant-enriched fugitive dusts and impacts to fisheries and aquatic resources. Both pollutants and resources are mobile and the mine therefore has the capacity to affect conditions in NPS conservation units.	All stakeholders need to be involved in these discussions, as pollutants and aquatic resources impacts don't respect lines drawn on a map. Same comment for other land managers in the vicinity.	
11	3.9.1	3.9-2	5			Section 3.9.1, Traditional Knowledge, of the EIS states that TEK, and the cultural value of subsistence as a chosen lifestyle, as described by Boraas and Knott (2013) were reviewed during development of the subsistence section and incorporated into the subsistence section. The EIS says that in this way, TEK regarding areas of subsistence use and harvest data, processing and sharing, and how information is transmitted over generations are incorporated into the analysis of Section 4.9, Subsistence. Boraas and Knott's report painstakingly documents, through oral history interviews, research in communities, and other sources, Yup'ik and Dena'ina people's connections to the land and resources over time in the Nushagak and Kvichak watersheds. Although the EIS has added this reference to the section on subsistence, there is still not adequate recognition of the cultural and spiritual importance of subsistence over many generations within a specific ecosystem.	
12	3.11.2.3	3.11.4		This section identifies key observation points representing common and/or sensitive viewer locations within the EIS area. It should include a location within Lake Clark National Park.	Add an additional key observation point that is area-based for NPS lands	A Key Observation Point should be in Lake Clark National Park and Preserve. One of the founding features of LACL is the scenic value, so it should not be excluded.	
13	3.11.2.4 and 4.11.1.1	3.11-4 and 4.11-4	4 and 1	… the National Park Service (NPS 2013b) monitoring report includes photographs that depict artificial night glow;	Replace "artificial night glow" with "natural airglow."	The cited NPS report describes "moderate airglow," which is naturally occurring, and states that "There are no visible lights (or domes) anywhere along the horizon that can be seen with the naked eye."	

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14	3.12.3.3	3.12-10	all			The lightering operation proposed for Alternative 1 (figure 2.26) places the point of transfer to the large bulk carrier in an area identified as having high wave potential (figures 3.16-11 and 3.16-12). This is of concern as it increases the potential for a spill incident as it requires much smaller vessels to transit and maneuver in higher wave potential areas for the lightering process to initiate. It also places the vessels in a very different location within Cook Inlet with different currents and spill fate scenarios.	
15	3.12-2	3.12-5	Table 3.12-2	This table omits the second runway in Port Alsworth, the Wilder/Natwick Runway	Add this runway to the table as it sees equal or maybe greater use to the Port Alsworth (TPO) runway		
16	3.14	3.14-2	5	Further evaluation of limited upland soil chemistry baseline data for the transportation corridor…was not conducted because neither of these components is considered to have mechanisms or chemical sources that could result in adverse impacts to soil.		A great deal of heavy metal enriched dust was released along the Red Dog Mine Haul Road by vehicular traffic (Hasselbach et al. 2005, Neitlich et al. 2017). While some of the contaminants come from the concentrate haul trucks, much is dispersed from mine site mud that is tracked out along the transportation corridor. Even passenger vehicles at Red Dog have mud containing thousands of ppm of Pb, Cd, Zn. In Pebble's case, the outside of all vehicles and containers are likely to become sources of heavy metal pollution. To address this issue proactively, PLP and stakeholders should hire an independent environmental consulting firm to obtain baseline samples from the entire transportation corridor out to a distance of 10 km and including inside of Lake Clark National Park. Based on Appendix 3.14, it appears that levels of Ar, Cd, Cr, Cu, Pb and Hg are considerably elevated in mine site soils above Alaskan baselines. It is essential that soils along the transportation corridor also have baselines. If operations are able to minimize spread of contaminants, this will also be to the mine operator's benefit to be able to prove they were not responsible for pollution in excess of natural conditions.	Neitlich, P.N., Ver Hoef, J.M., Berryman, S.D., Mines, A., Geiser, L.H., Hasselbach, L.M. and A. E. Shiel. 2017. Trends in spatial patterns of heavy metal deposition on National Park Service lands along the Red Dog Mine haul road, Alaska, 2001–2006. PLoS ONE 12(5): e0177936. https://doi.org/10.1371/journal.pone.0177936. Hasselbach, L., J.M. Ver Hoef, J. Ford, P. Neitlich, E. Crecelius, S. Berryman, B. Wolk, and T. Bohleet al. (2005). Spatial patterns of cadmium and lead deposition on and adjacent to National Park Service lands in the vicinity of Red Dog Mine, Alaska. Sci. Total Environ. 348:211–230.
17	3.15.2.1	3.15-8	1	Bulk TSF South.	A failure of any of the Tailings Storage Facility dams would be likely to send a highly toxic slurry into the Koktuli River or possibly into Iliamna Lake.		
18	3.16.33		all			There is a distinct lack of information in general in the 1 paragraph Marine Water Dynamics – Tides, Currents, and Storm Surge (Page 3.16.33) section. There is no information about currents to enable any review of the potential downstream timing, impacts, and effects of a spill of any type at the marine port facility or in the lightering operation. This is a significant concern because of the potential for copper in extremely small quantities to have significant deleterious effects on marine invertebrates and the marine lower trophic system. It is recommended to included currents in the analysis.	
19	3.17	3.17-1	1	This section describes the distribution and movement of groundwater in soil, sediment, and rock beneath the ground surface that could be impacted by the project.	This section describes the potential for connectivity of contaminated waters with groundwater at a variety of scales.	The main issue here is not depletion of groundwater. Rather it is how contaminants might be contained in such a wet environment with high water movement and high seismic activity. This chapter never discusses the high likelihood of at least local contamination of the groundwater from mining operations.	
20	3.25.1.5	3.25-8	Habitat Use and Distributi on			The DEIS cites the recent FWS report on sea otter abundance and distribution (Garlich-Miller et al. 2018) but fails to provide an accurate figure that shows the results from that survey. The DEIS includes a figure of designated critical habitat (Figure 3.25-1) from 2011. The species distribution portrayed in this figure is not representative of current sea otter abundance or distribution in neither the southwestern population (currently listed as Threatened under ESA) nor the southcentral population. The DEIS states “Very few otters from the Southcentral Alaska Stock occur north of Anchor Point (Rugh et al. 2005; Gill et al. 2009), especially during winter months (USFWS 2014d).” However, more recent information would say the contrary (see attached Figure). Large numbers of sea otters were observed between Anchor Point and Clam Gulch. Also not included in the T&E section were abundance estimates from recent surveys of lower Cook Inlet. These figures are readily available and should be included in the DEIS.	

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21	3.25.1.6	3.25-9	Habitat Use and Distribution			Unrecognized in the DEIS is the recent recovery of sea otters along the coast of Katmai National Park and Preserve. Sea otters were hunted to near-extinction during the fur harvest and as late as 1989, the population along the Katmai coast numbered less than 1000. Recent aerial surveys suggest the population has reached an equilibrium density of around 8600 (Coletti et al. 2016). This population is part of the ESA listed population of sea otters and would be at risk from any 'downstream' contamination incidents due to port activities. The sea otter is also a keystone predator in the North Pacific nearshore food web and an important component of nearshore marine ecosystems in the north Pacific (Estes and Duggins 1995).	
22	3.26.1	3.26-1	5	Mine Site--The analysis area for the mine site includes a 330-foot buffer around the direct disturbance footprint and potential drawdown zone from the open pit.	The analysis area for the mine site includes a 3 km analysis area around the direct disturbance footprint and potential drawdown zone from the open pit. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the mine site (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). There is no data from the mine site, but since it's considerably more contaminated than the haul road it is likely that the impact zone extends further. Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
23	3.26.1	3.26-1	6	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 330-foot buffer around the direct disturbance footprint.	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 3 km analysis area around the direct disturbance footprint. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the haul roads (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
24	3.26.2	3.26-2	4	To compare vegetation types between the three action alternatives in the analysis area for all four components, detailed ACCS land cover types were dominant growth forms (tree, shrub, or herb), vegetation density (open or closed canopy), and average height (tall, low, or dwarf) from each classification system.		In a 6 mile buffer around the Open Pit, the ACCS landcover maps shows the majority of habitat as "Lichen", "Dwarf Shrub-Lichen", "Bareground", and "Dwarf Shrub" habitat types. These types are all high in lichen cover and would be the most sensitive to fugitive dusts enriched with Cu and other heavy metals. We recommend reworking this section only with the detailed habitat types actually present in the mine site and the transportation corridors. Aggregating to higher levels named by vascular plants (which are less sensitive to contaminants) omits the classes above that are highly at risk from fugitive dusts and essentially negates the risk to this nonvascular plant-rich ecosystem. As drafted, this chapter does not accurately depict the nature of the vegetation at risk.	
25	3.26.4.1	3.26-5		Mine Site- The mine site is characterized by a predominance of shrub types…	Mine Site--The mine site is characterized by a mix of habitats including Lichen, Dwarf Shrub-Lichen, Bareground, and Dwarf Shrub habitats…	Same comment as above: by aggregating into vascular plant-dominated groups, the DEIS have understated the risks to sensitive community types dominated by nonvascular plants.	
26	3.26.8	3.26-15	1			The invasive species description only considers invasive species already established in or near the project area, and is only developed in reference to the effect of climate change on invasives in the section that follows. The real threat of this project in terms of invasive species is in the delivery to the project transportation corridor and mine site in soils adhering to heavy equipment that is brought in for the purposes of this project. In order to address this primary vector, the location, cleaning process, and inspection process for all equipment coming to the site, including all of the transport containers, needs to be addressed.	
27	4.1.2	4.1-25	1	Biological Science Topics	Add discussion of effects of contaminants on sensitive vegetation within the Vegetation and ecosystems topic.		

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28	4.1.2	4.1-25	1	Physical Science Topics	Add fugitive dust (spatial patterns of heavy metal-enriched fugitive dust deposition) as a topic under Physical Science		
29	4.1.2	4.1-25	1	Physical Science Topics	Add Stability of Tailings Storage Facilities as a topic under Physical Science		
30	4.9	4.9-1	1	"The magnitude of impact from the project depends on the past and current level of subsistence use that would be impacted, the extent to which opportunities to harvest and experiences are altered, as well as the ability of subsistence users to relocate to another area with similar opportunities and experiences."	The magnitude of impact from the project depends on the past and current level of subsistence use that would be impacted, and the extent to which opportunities to harvest and experiences are altered.	The statement as written focuses on the levels of subsistence uses and numbers of opportunities, but does not consider the connections of subsistence users to a specific ecosystem through direct contact with the environment. Relocation to another area with similar harvest opportunities may present many difficulties and would disrupt the transmission of TEK over generations.	
31	4.9.2.4.	4.9-9	All			The EIS states that the project would result in both beneficial and adverse effects on sociocultural dimensions of subsistence. The beneficial effects are economic: Increase in cash income for local residents would lead to more money to use for subsistence equipment, supplies and operating costs. An adverse effect is that project-related employment may reduce the time available for subsistence hunting. The report also acknowledges that project-related employment may reduce the time available for passing on skills and knowledge to the next generation, including traditional knowledge about subsistence. The analysis recognizes that an important potential adverse effect of the project is interruptions and discontinuations in the process of transmission of TEK. The suggested response to reduce those effects is for the company to offer flexible leave options for traditional subsistence practices. This might provide flexibility to some employees but would not address the community as a whole. The DEIS also acknowledges that the project may result in lasting cultural perceptions of resources as contaminated or polluted, but does not address the possibility that such perceptions may be accurate observations of damages to resources.	
32	4.11.1.1	4.11-3	Table 4.11-1	Description of Effects column, at 1% above natural conditions: "Values of solitude and the absence of visual intrusion of human development begin to occur. Attention should be given to protect the site from future increase in light pollution."	"In areas protected for scenic or wilderness character, a significant impact on the values of solitude and the absence of visual intrusion of human development occurs. Attention should be given to protect the site from future increase in light pollution."	We appreciate the addition of light pollution impact assessments estimated from Falchi, et al. 2016 in this draft of the EIS. However, the description of effects at 1% above natural conditions does not adequately reflect the authors' statement regarding impacts to areas that are protected for scenic or wilderness character, such as Katmai NP&P and Lake Clark NP&P. Falchi, et al. assert that horizon glow has a significant impact on values of solitude and the absence of visual intrusion of human development in the direction of artificial light sources when zenith artificial sky brightness is 1% above natural conditions.	
33	4.11.3.1	4.11-7	2	The magnitude of the impact would be seven low-elevation flightpaths (lower than 14,000 feet) between these two locations that cross sensitive receptors at Lake Clark National Park and Preserve and communities. If these routes are used frequently for the project, there could be additional impacts to the soundscape from these flights.		Please provide a map showing these seven flight routes between Anchorage and Iliamna. They will assist the NPS monitor the potential impacts to Lake Clark National Park and Preserve mentioned in this passage.	

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34	4.11.3.1	4.11-6	2	(impacts on night sky in areas 15 to 40 miles from the mine site)	Add predicted night sky brightness impacts that were modeled for the 2013 monitoring site in Lake Clark NP&P. The monitoring location, Keyes Point, is 24 miles from the proposed mine site.	In the absence of a draft project lighting plan in the DEIS, NPS contracted Dark Sky Partners, LLC to conduct an impact assessment of the proposed Pebble Project on night sky brightness at Keyes Point under two potential lighting design conditions, with and without snow cover (see attached report). Using an approximation of project lighting parameters as described in the DEIS, the model predicts that in the direction of the proposed mine, maximum night sky luminance would increase over existing conditions by 886% when snow is on the ground, if the light fixtures are unshielded. Fully shielded light fixtures would increase the maximum sky luminance over existing conditions by 570% with snow on the ground, and 103% with no snow on the ground. When averaged over the entire night sky, brightness (average sky luminance) would increase 4% to 15% over existing conditions, depending on shielding and snow cover conditions.	
35	4.11.3.2	4.11-8	4	Less than 1 percent of Katmai would be affected		The analysis of the mine and road corridor on aesthetic resources of the area focuses on the area of land base where the impacts would be visible. However, unlike many regions of the country, southwest Alaska is largely accessed by air. The visual impact of development is substantial in that it would be seen by visitors to any lodge or land area that is accessed by small plane passing over the area. Katmai Preserve has many visitors that access it from lodges around Lake Clark and Lake Iliamna, as well as from Anchorage and Homer. Areas as far south as Brooks Camp within Katmai also have daily small plane arrivals from the same locations, all of which would pass within view of either the mine site or the transportation corridor or both. The aesthetic nature of the flight experience of all these visitors would be impacted by the developments. This should be considered and addressed, and where feasible, mitigated, because this tourism is a very substantial portion of the Bristol Bay economic base.	
36	4.11.6	4.11-24	Table 4.11-7			In the row "All Components", please add text describing the expected noise impact from transportation flights expected from each alternative.	
37	4.14.2	4.14-2	1	Soil quality is also evaluated for the mine site due to potential fugitive dust impacts from sources of concern.	Soil quality is also evaluated for the mine site and the transportation corridors due to potential fugitive dust impacts from sources of concern.	As is the case at Red Dog Mine, fugitive dust impacts are to be expected along all transportation corridors (Neitlich et al. 2017)	
38	Table 4.14-1	4.14-4				Cu, Zn and total S should be included in this table as they have profound environmental consequences. In addition, the concentrations of contaminants in soil is inherently a spatial issue, with greatest concentrations closest to centers of concentrate handling. To where in the mine site do these estimates pertain? Because of the amount of tracking of concentrates and ore around the road surfaces of the mine site, these numbers seem to capture only a minute fragment of the contamination likely. At the Red Dog mine site, values of Pb, Zn and Cd above 10,000 mg/kg are common (Exponent 2007). The numbers in this table fail to account for the widespread tracking of contaminants by vehicles.	

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39	4.14.2.2	4.14-9	5	The most probable source/activity of soil quality impairment would be concentrate handling. Sealed bulk containers would be emptied offshore in the hold of bulk carriers (i.e., ship), at a depth of no less than 20 feet below the hatch (PLP 2018-RFI 007). The calculated magnitude of total fugitive particulate matter generated on a yearly basis during offshore transfers is 0.002 ton per year (4 pounds). For these reasons, the magnitude and potential of soil quality impact from project activities at the port are considered negligible, and unlikely to impact soil quality in upland conditions. The geographic extent of soil quality impacts (if any) would be confined to the immediate port footprint, of which the duration would be predominantly limited to the construction and operations phases.		Would the outer surfaces of the containers be pressure washed following emptying into the ship? If not, then introducing dirty containers onto the roadway would track additional contaminants onto the roadbed to be dispersed by vehicles. In addition, would the containers be washed at the mine site prior to being loaded with concentrate? Again, if not, this is an additional vector for the spread of concentrate through fugitive dusts. If the containers would not be washed, then the comment that project activities at the port are unlikely to impact soil quality in upland conditions is not likely to be true.	
40	4.16.3.3	4.16-32				In general, DEIS failed to accurately assess the risk and potential damage to marine and coastal resources during Amakdedori Port activities as well as any activities (including lightering operations) within Cook Inlet. An obvious risk would be some sort of contaminant spill in marine waters during transport activities. Diesel fuel was the focus of the DEIS; however, the fate of diesel fuel is not completely analyzed in the spill sections. Diesel is a moderately volatile oil that may be persistent in the coastal environment. While it is true that a significant portion of the diesel fuel may evaporate, there is still a portion of persistent residue that may remain and is not addressed in the DEIS. The amount of oil persistence should be made clear in relation to potential diesel fuel spills. As referenced in previous comments, water dynamics (currents, tides, storms, etc.) have also not been thoroughly addressed. The incomplete analysis of contaminant persistence in marine environments coupled with poor accounting of the fate of those contaminants leads to under-estimating impacts to the biological habitats and species that exist not only within a given radius of the proposed marine activities but also 'downstream' of any port-related activities.	

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41	4.16.3	4.16-32				Marine ecosystems are experiencing a variety of environmental stressors (increased water temperatures, OA, cascading effects of shifts in food webs due to changing ocean conditions, etc.) that recovery from added stressors, such as contamination from fuel spills, will likely be exacerbated and protracted. For example, the 2015-16 common murre mass mortality event in the northeast Pacific exceeded previously described seabird mass mortalities in spatial extent, duration and magnitude. Conservative estimates for mortality in the Gulf of Alaska are 225,000 to potentially exceeding 1 million birds. The mass mortality, coupled with some colony failures during the die-off, collectively suggest a shift in the marine ecosystem of the north Pacific (Piatt et al. In Prep) due to the marine heatwave experience throughout the Gulf of Alaska. The recent marine heatwave likely contributed to sea star declines across the Gulf of Alaska through the increased transmission of pathogens (termed “Sea Star Wasting Disease” or SSWD). As with the common murre die-off, the spatial extent, magnitude and number of species affected are several times greater than described during previous die-offs (Menge et al., 2016). Temperature has been correlated with SSWD and the recent marine heatwave in the Gulf of Alaska is likely a large-scale environmental stressor proliferating the disease (Harvell et al. 2019 Eisenlord et al., 2016; Hewson et al., 2018; Miner et al., 2018). Many sea star species are considered ‘keystone’ species (Paine, 1966) and the loss of stars likely has drastic consequences to the nearshore marine ecosystem and recovery has not yet been observed across study sites in the Gulf of Alaska, including two national parks (Katmai and Kenai Fjords) (Mitchell et al. In Prep).	
42	4.17.3.1	2	All			The information in the Environmental Baseline documents indicated that at least one of the deep boreholes (completed to the general maximum mine depth) was not able to be used effectively for testing. The DEIS states that three deep wells were used to develop the groundwater models for the deeper aquifer system. In addition to the recommended model analysis suggested by the State, the models and model parameters should be tested by experts at the USGS to evaluate both the results and limitations of the model.	
43	4.18	4.18-4	last	Based on an independent review of the WTP source terms and processes (Appendix K4.18;AECOM 2018i), discharge water from both WTPs is currently expected to meet ADEC criteria)	Although In the fish values section no effect was indicated from WTP effluent into the three rivers, the data review suggest otherwise. See comments.	Based on review of Knight Piesold benchmark studies, predicted water quality from Waste Treatment Plants (see Knight Piesold 2018a DEIS documents at ACE site; Table B1-3 pg Outflow concentrations from Water Treatment Plant) treated effluent from WTPs will significantly differ from natural waters (PLP EBD) in a number of potentially toxic constituents. For example, the amount of aluminum proposed for discharge is above the chronic and acute Water Quality Standards depending on the site’s pH, total hardness, and DOC; the amount of Hg (mercury) proposed for discharge is about 8 x more than the chronic toxicity level (4-d ave.) and is 4.4 x more than the acute toxicity level (1-h ave.); and the amount of sulfate to be discharged to the environment is of concern since it increases methylmercury (MeHg) production in aquatic environments, which can impact aquatic resources, including fish and plants, as well as terrestrial piscivorous predators, and human subsistence users (see Paranjape and Hall 2017 attached). Selenium is naturally very low in these systems (PLP EBD), and increased planned discharges from the WTP as well as the potential accidental releases of mine water waste due to failures could lead to bioaccumulation of Se and ultimately cause physical deformities, reproductive failure, and even death in aquatic organisms (see attached Tan et al. 2016, EPA 2016). These potential direct and indirect impacts also need to be addressed in the Fish Values section.	EPA 2016. Aquatic Life Ambient Water Quality Criterion for Selenium in Freshwater 2016 - Fact Sheet. EPA 822-F-16-005. www.wpa.gov; EPA 2018. Fact Sheet: final 2018 Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwaters. EPA 8222-F-18-003. www.epa.gov; Paranjape, A.R. and B.D. Hall. 2017. Recent advances in the study of mercury methylation in aquatic systems. FACETS 2: 85-119. DOI: 10.1139/FACETS-2016-0027; Schiavon, M., A. Ertaini, S. Parrasia, F.D. Vecchia. 2017. Selenium accumulation and metabolism in algae. Aquat Toxicol. Aug 189: 1-8; Zhu, Y.G., E.A. Pilon-Smits, F.J. Zhao, P.N. Williams, A.A. Meharg. 2009. Selenium in higher plants: understanding mechanisms for biofortification and phytoremediation. Trends Plant Sci. Aug, 14 (8): 436-42; Tan et al 2016. Selenium: environmental significance, pollution, and biological treatment technologies. Biotechnology Advances 34 (2016) 886-907.

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44	4.23	4.23-16 to 4.23-18				The high frequency of traffic with no periods of reduced activity would make the roads essentially barriers to wildlife. Considering the effects of roads/traffic on bears in the literature cited in this section and known high quality bear habitats in the areas in which the roads would be constructed, it would be expected that localized population effects could occur due to large scale habitat fragmentation. Local TEK and radio collar data indicate movements from areas north of the mine site and north road in alternative 3 to areas south as salmon enter the system.	
45	4.23.2.2	4.23-14-20	all			The section regarding impacts to terrestrial animals notes accurately that impacts to wildlife often include exclusion from roaded areas. However, there are some shortcomings of the analysis. First, it implies that caribou impacts would not be important since the larger body of the Mulchatna Herd is located elsewhere. In reality, the caribou at the fringes of the Mulchatna Herd habitat, which include the caribou that have been using the Amakdedori area, seem to be less subject to the large fluctuations of the herd as a whole, and may be important for the future growth of the herd. Therefore, the impacts to these animals should be clearly disclosed. Further, since roads and traffic activity are known to be impactful to a broad array of wildlife, especially, in this case, to caribou and to bear, the analysis should consider mitigations of having a road closure for a consistent 8 hour period of time in each day. A transportation corridor so close to McNeil River and to Katmai Preserve would have important implications for movement and dispersal patterns of bears, and a predictable period without transportation activity would facilitate animal access across this zone and promote the continuation of natural dispersal and migration throughout the region.	
46	4.24	Habitat Loss	All sections pertaining to habitat loss and salmon abundance	all sections pertaining to habitat loss and salmon abundance	Authors should consider incorporating the widely recognized concept of salmon stocks and the "portfolio effect" in this DEIS. The Bristol Bay salmon stock portfolio performs much like a diversified financial portfolio, all the smaller spawning populations contribute to the stability over time of the whole. Last year, Bristol Bay produced an estimated 62 million wild sockeye salmon. However, reductions in stock diversity, e.g., removing various small populations that contribute to the overall productivity, such as SFK, NFK, etc. can impact overall productivity through time.	The portfolio concept in ecology and evolution By: Schindler, Daniel E.; Armstrong, Jonathan B.; Reed, Thomas E. FRONTIERS IN ECOLOGY AND THE ENVIRONMENT Volume: 13 Issue: 5 Pages: 257-263 Published: JUN 2015 Performance of salmon fishery portfolios across western North America By: Griffiths, Jennifer R.; Schindler, Daniel E.; Armstrong, Jonathan B.; et al. JOURNAL OF APPLIED ECOLOGY Volume: 51 Issue: 6 Pages: 1554-1563 Published: DEC 2014 Synchronization and portfolio performance of threatened salmon By: Moore, Jonathan W.; McClure, Michelle; Rogers, Lauren A.; et al. CONSERVATION LETTERS Volume: 3 Issue: 5 Pages: 340-348 Published: SEP 2010 Population diversity and the portfolio effect in an exploited species By: Schindler, Daniel E.; Hilborn, Ray; Chasco, Brandon; et al. NATURE Volume: 465 Issue: 7298 Pages: 609-612 Published: JUN 3 2010	

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47	4.24.		all	entire section	Revise and add section that discusses past and future predicted impact of climate change on stream thermal regimes and precipitation in the region	Climate change is already affecting the Bristol Bay region and should not be ignored in the DEIS relative to stream thermal and hydrologic regimes. The baseline conditions measured during the 2000s and presented in the DEIS are higher than historic levels. For example From 1949-2012, the Bristol Bay region's average winter temperature (Dec / Jan / Feb) increased by a total 7.56 F (4.2 C) (a statistically significant increase at the 95% level); the average spring temperature (March/ Apr/ May) increased by 3.96 F (2.2 C) (a statistically significant increase at the 95% level); the average summer temperature (June/ July/ August) increased 1.44 F (0.8 C) (a statistically significant increase at the 95% level); The average fall temperature (Sept / Oct / Nov) increased 0.72 F (0.4 C) (not statistically significant at the 95% level) (Bieniek et al. 2014). The mean accumulated spring precip decreased by 8.3 mm during that same time period. All three of those trends are significant at 95% level (see Fig 14 Bieniek et al. 2014). Note: these are not future projections, they are the trends from the 're-analyzed' observation record. These warming trends are projected to continue (Chapin III et al. 2014), with winter extreme temperatures expected to continue warming much faster than other climate extremes (such as summer maximum temperatures) (Lader et al. 2017). In conjunction with the greatly increased precipitation expected throughout Alaska, freezing temperatures and frozen precipitation are expected to be "… increasingly less frequent by late century" (ibid, page 2407). Projections are for a greatly increasing trend for greater extreme precipitation in the Bristol Bay area from 2041 to 2070 (Lader et al. 2017). That work's projections are for an annual total precip at King Salmon to increase from an average annual total of 772.03 mm for 1981-2010 up to an average annual total of 1050.73 mm for 2041-2070 and to 1139.54 mm from 2071-2100 (ibid, Table 3). This could lead to increasing warm-season flash flooding…. Recent work by Littell et al. (2018, and in review) project that for the Pebble deposit region, by 2040-2069, there will no longer be any months with reliable snow cover (Figure 2, Littell et al. in review). In conjunction with the projected increase in precipitation, the projections suggest a shift in streamflows to a more transitional hydrograph (ibid).	Bieniek, P.A., and Coauthors 2012. Climate divisions for Alaska based on objective methods. J. Appl. Meteorology and Climatology. 51, 1276-1289. Bieniek, P. A., J. E. Walsh, R. L. Thoman, U. S. Bhatt. 2014. Using climate divisions to analyze variations and trends in Alaska temperature and precipitation. Journal of Climate 27, 2800-2818. Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze, 2014: Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 514-536. doi:10.7930/J00Z7150. http://nca2014.globalchange.gov/report/regions/alaska Lader, R., J. E. Walsh, U. S. Bhatt, P. A. Bieniek. 2017. Projections of Twenty-First-Century Climate Extremes for Alaska via Dynamical Downscaling and Quantile Mapping. Journal of Applied Meteorology and Climatology 56, 2393-2409.
48	4.24..2.3		Tables of fish species should include all fish in assemblage.		Only select fish species are considered in the DEIS. The entire fish assemblage is indicative of the health and biodiversity of the aquatic system that supports subsistence fisheries, yet this is not included nor considered. In fact, the health and productivity of the selected priority species depends on the very species omitted, such as sculpin, please include all species since they all matter. Please revise Tables to include all known occurring fish species in assemblages. For example, Slimy Sculpin, Northern Pike, Lamprey, Three-spine stickleback, … occur in the impact area yet are not included.	Entire fish assemblage should be considered since changes in composition relative to development can be indication of potential impacts. For example, studies of a hard rock mining impacted region in Idaho showed sculpin missing from impacted assemblages indicating they are a sensitive indicator to metal mining. Sculpin are an important abundant forage fish in the Bristol Bay region and are considered more sensitive indicators of metal impacts to freshwater. Sculpin should be included in all these analysis since they are the most abundant species in the area, are sessile, provide food for predators such as Coho, Chinook, Rainbows etc. Northern Pike occur in the mine region and should also be included in the EIS since they are resident long lived and serve as good bioindicators. See: Use of small forage fish for regional streams wildlife risk assessment: Relative bioaccumulation of contaminants By: Yeardley, RB. 2000. ENVIRONMENTAL MONITORING AND ASSESSMENT Volume: 65 Issue: 3 Pages: 559-585 Published: DEC 2000 Maret & MacCoy. Fish Assemblages and Environmental Variables Associated with Hard-Rock Mining in the Coeur d'Alene River Basin, Idaho. Transactions of the American Fisheries Society 131:865–884. Cooper et al. 2015. Identifying indicators and quantifying large-scale effects of dams on fishes. Ecological Indicators Volume 61, Part 2, February 2016, Pages 646-657 Cooper et al. 2017. Assessment of dam effects on streams and fish assemblages of the conterminous USA. Science of The Total Environment Volume 586, 15 May 2017, Pages 879-889. Esselman et al. 2013. Regional fish community indicators of landscape disturbance to catchments of the conterminous United States Ecological Indicators Volume 26, March 2013, Pages 163-173	

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49	4.24.2.1	pgs. 2-6 Habitat Loss	All paragraphs pertaining to estimates of impact on salmon abundance due to habitat loss from development.	For example, summary section on page 6 indicates "low use of coho and chinook rearing habitat,…, low level of spawning in NFK Tributary 1.190…measureable impacts unlikely" Similar sections follow.	Further analysis/clarification needed. Specifically, exactly how fish density estimates were calculated in the recently submitted draft study (Owl Ridge 2019) using PLP EBD aerial escapement data for spawning adult salmon and for juvenile salmon: snorkel, minnow trap, gill net, dip nets, tangle net data ... is unclear. Assumptions, methods, calculations, exactly what data were used, parameters, etc. are unavailable. This should be made clear to the public; this current format of fish density, is unclear and potentially misleading.	The assessment that direct loss of habitat will have low impact on select subsistence salmon populations is based, in part, on analysis of aerial escapement data for adult salmon and on juvenile salmon surveys that use a diverse array of unstandardized methods. This data is then converted in a non-transparent manner to fish density estimates, using unknown methods, unknown data selection, assumptions are not presented, and therefore, it is potentially misleading. Using intermittent, adult salmon, aerial escapement counts to then, "where possible" (pg. 11 Owl Ridge Natural Resource Consultants, Inc. 2019. Draft Essential Fish Habitat Assessment Pebble Project) estimate large scale fish densities by stream segment length, and from that provide an estimate of potential level of impact, is unprecedented and not a scientifically defensible method for determining population level effects from proposed development. Impacts are discussed at the "individual level", which is in itself unclear. Conclusions drawn from the density information are essentially that no impact to salmon populations, but upon what data and analysis is this actually based? Please clarify.	
50	4.24.2.2	8	Section on Transportation Corridor Ferry Operation	No section on accidents or spills included in this section.	Consider including a section that includes an accident scenario and effects where a ferry transporting ore sinks or has some mishap and the ore ends up in Iliamna Lake. How might such an accident impact the rearing, migrating, incubating salmon and resident species? It is unclear exactly how much ore and exactly what concentrate levels will be on each barge, what the risk of such and occurrence are etc.	The concern is that copper/Zn ore will be released into Iliamna Lake. The lake is extremely dilute and has a low buffering capacity. Copper is highly toxic to fish and since the lake is the world's most important sockeye salmon nursery lake, potential impacts from an accidental spill or barge accident should be considered and analyzed for this DEIS. McIntyre et al 2012 Low-level copper exposures increase visibility and vulnerability of juvenile coho salmon to cutthroat trout predators Ecological Applications, 22(5), 2012, pp. 1460–1471 COPPER HAZARDS TO FISH, WILDLIFE, AND INVERTEBRATES:A SYNOPTIC REVIEW Ronald Eisler Patuxent Wildlife Research Center U.S. Geological Survey Laurel, MD 20708 Olfactory toxicity in fishes Aquatic Toxicology 96 (2010) 2–26	
51	4.24.2.7	23-25	all paragraphs pertaining to temperature monitoring exceeding DEC criteria	This section indicates mining will increase thermal regimes and that PLP monitoring during 2004-2009 showed that ADEC fish protection standards for water temperature criteria are already exceeded.	This section needs to be reanalyzed and rewritten taking into account the warming trends already documented in the Bristol Bay region (see citations), predicted future trends, as well as mine alternatives. Because thermal regimes in streams are already increasing due to climate change, increases from proposed development can exacerbate impacts to fish important to subsistence. The fact that thermal regimes are documented as increased already should be acknowledged and incorporated into section 4.24.2.7	The fact that climate has already warmed considerably in the region should be considered and noted in this section relative to the reported "exceedances." A recently published study indicates: From 1949-2012, the Bristol Bay region's average winter temperature (Dec / Jan / Feb) increased by a total 7.56 F (4.2 C) (Bieniek et al. 2014); the average spring temperature (March/ Apr/ May) increased by 3.96 F (2.2 C) (ibid). Mean accumulated precipitation decreased by 8.3 mm during that same time period. All three of those trends are significant at 95% level (see Fig 14 Bieniek et al. 2014). Note: these are not future projections, they are the trends from the 're-analyzed' observation record. These warming trends are projected to continue (Chapin III et al. 2014), with winter extreme temperatures expected to continue warming much faster than other climate extremes (such as summer maximum temperatures) (Lader et al. 2017). In conjunction with the greatly increased precipitation expected throughout Alaska, freezing temperatures and frozen precipitation are expected to be "… increasingly less frequent by late century" (ibid, page 2407).	

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52	4.24.2.7	23	Last section paragraph 1	"In each year of study, the daily maximum water temperature in the NFK immediately upstream of the mine site exceeded the 20C criteria on about 29 percent of all instantaneous readings during the summer months. The lower ..."	The presentation of thermal exceedances presented as percentages of instantaneous readings is inadequate for any evaluation of potential impact of additional thermal increases from development relative to subsistence fishery resources. Please provide basic statistical summaries of thermal data in text or in a Table, suggest standard seasonal annual maximum and minima (Tmax, Tmin), seasonal mean (Tmean) seasonal median (Tmed), the annual maximum of a seven-day running average of mean daily stream temperature (MWAT) and the annual maximum of a seven-day running average of maximum daily temperature (MWMT) and ranges by season; not percentages of instantaneous thermal maxima over 20C. What matters, relative to fish, is how long such temperatures persist, not that they occur for an instant or an hour each day.	Presenting daily maxima temperature data as a percent of all instantaneous readings relative to fishery resources in this manner is misrepresentative. What is more appropriate and useful from a fish resources perspective are standard basic statistical summaries, or better yet, a figure. Fish move when it gets too warm and stream temperatures can change rapidly throughout the day. What matters relative to potential stress levels fish are experiencing are how long warm stressful thermal regimes persist in an area (one hour vs. one week). The frequency and duration of such temperatures can easily be presented in a graph, with max, min median and mean in one nice picture which a biologist can rapidly process. Relative to fish, understanding thermal regime patterns is crucial particularly when proposals to increase stream thermal regimes are presented.	
53	4.24.2.7	section	all	All discussion regarding "optimal temperatures" for spawning, rearing, incubation, migration etc. are based on a 1991 unpublished, non-peer reviewed literature review by Weber Scannell.	Section needs reanalysis based on an updated literature review focused more on studies of Northern Latitude thermally adapted populations versus Southern ones.	Because temperature affects all physiological, biochemical and life history activity of fishes, it should be carefully considered in this DEIS because this development would increase stream thermal regimes which has implications for subsistence fisheries. The section focuses, in part, on fish "optimal temperatures", but presentation of "optimal temperatures" is based on a single, outdated, unpublished literature review from 1991 wherein the author indicates (pg. 5) that the information is primarily focused on more southern populations of fish and the information may not be pertinent to AK (because salmon adapt to stream thermal regimes). A more thorough, updated literature review focused on thermal studies of Northern Latitude populations (versus Southern) should be conducted and integrated into this section. A quick literature review of the academic "Web of Science" indicated numerous recent pertinent references more applicable to discussions of fish thermal tolerance ranges and optimums in this section than this single outdated review, for example: Temperature tolerances of North American freshwater fishes exposed to dynamic changes in temperature. Beitinger et al. 2000. Environmental Biology of Fishes 58:237-275; And Konecki and Woody. 1995. Critical Thermal Maxima of coho salmon under field and laboratory acclimation regimes. Can. J. Zool. 73:993-996. Review of the peer reviewed published literature on thermal optimas should be done, then applied, and integrated into this DEIS.	

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54	4.24.2.7	section	all	all presentations of "instantaneous temperature" percentages. For example, 1st para, second to last sentence "...in the NFK immediately upstream of the mine site exceeded the 20C criteria on about 28 percent of all instantaneous readings during the summer months."	Revise presentation of empirical data. Instantaneous reading percentages over a year is non-standard presentation of thermal data for aquatic systems. Data from temperature probes relative to exceedances of ADEC standards (e.g. exceedances of 20C, 15C, 13C) needs to be presented in a manner that is biologically meaningful from a subsistence fisheries standpoint, not as instantaneous reading percentages over a year.	Empirical stream temperature data should be presented in a manner relevant to biologists/agencies evaluating potential impacts of development on fish. What matters to fish, and therefore fish managers, is the frequency, duration and extent of high temperatures as well as availability and accessibility of cooler thermal refuges, such as springs- which abound in that region due to upwelling groundwater. Stream temperature data from all area thermistors can be presented as thermal maps (see fs.fed.us/rm/boise/AWAE/projects/NorWesT/images/ThermalscapeWesternUS_StreamTemperaturesFinal.jpeg) or in an easy to understand and interpret figure showing daily mean, median, standard deviation, max, and min. Or replace instantaneous references in text with annual maximum of a seven-day running average of mean daily water temperature (MWAT), Seasonal Means, Seasonal Medians, Maximum Hourly temperature along with Standard Deviations. The manner in which data are presented is misleading. For example, the second to last sentence of the first paragraph indicates that the daily maximum water temperature criteria established by ADEC was exceeded 28 % of all instantaneous readings in the NFK. Which, for those not familiar with stream temperature data, fish behavior, or that region, could lead them to the conclusion that the NFK above the mine site is already too warm for fish. A review of publically available stream temperature data for 5 long term probes run by UAA on the Koktuli collected 2013-2017 do not show similar exceedances. See: https://knb.ecoinformatics.org which raises questions regarding exactly how probes were installed, where, and what QA/QC was conducted on the data?	
55	4.24.2.7	All sections referring to "optimum temperat ures"	23-25		Recommend to revise all statements that imply predicted thermal changes to streams from mine development will be more "optimum" for the Pacific salmon species that spawn, incubate, rear and migrate there unless substantive proof can be provided that such alterations of natural temperatures regimes would actually prove optimal for these Northern adapted populations.	The published "optimums" that are used in this section are not pertinent to Bristol Bay populations because of the more recent and abundant evidence that salmonid populations adapt to local thermal regimes. The optima cited in the DEIS are based on a single unpublished non-peer reviewed paper from 1991 focused on populations from primarily southern areas. The "optimas" cited in the DEIS are only relevant to the geographic region and the particular populations upon which studies were conducted.	Whitney et al. 2013. Provenance matters: thermal reaction norms for embryo survival among sockeye salmon populations J. Fish Biol.82:1159-1176. Whitney et al. 2014. Population origin and water temperature affect development timing in embryonic sockeye salmon. Trans. Am. Fish. Soc.143:1316-1329; Woody et al. 2000. Temporal variation in phenotypic and genotypic traits in two sockeye salmon populations, Tustumena Lake, Alaska.Trans. Am. Fish. Soc.129:1031-1043; Sparks et al. 2017. Thermal adaptation and phenotypic plasticity in a warming world: insights from a common garden experiment on Alaskan sockeye salmon, Glob Change Biol. 23:5203-5217).
56	4.26.1	4.26-1	2	Mine Site--The analysis area for the mine site includes a 330-foot buffer around the direct disturbance footprint and potential drawdown zone from the open pit.	The analysis area for the mine site includes a 10 km buffer around the direct disturbance footprint and potential drawdown zone from the open pit. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the mine site (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). There is no data from the mine site, but since it's considerably more polluted than the haul road it is likely that the impact zone extends further. Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	Neitlich, P. N., VerHoef, J. M., Berryman, S. B., Mines, A., Geiser, L.H. 2019. Impacts to lichens and tundra vegetation from heavy metals on National Park Service lands along the Red Dog Mine haul road, Alaska. In prep. Exponent. 2007. DMTS Fugitive Dust Risk Assessment Volume I – Report. November. Prepared for Teck Cominco Alaska Incorporated, 3105 Lakeshore Drive, Building A, Suite 101,Anchorage, AK 99517. Exponent, 15375 SE 30th Place, Suite 250, Bellevue, WA 98007. November 2007.

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57	4.26.1	4.26-1	2	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 330-foot buffer around the direct disturbance footprint.	Transportation Corridor and Ports – The analysis area for the transportation corridor and ports includes a 6 km buffer around the direct disturbance footprint. This buffer is designed to account for mortality and injury of plants sensitive to fugitive dusts from the haul roads (e.g., lichens, bryophytes).	At Red Dog Mine, the zone of effect from the haul road on lichens and bryophytes extended out to 3 km from the road (Exponent 2007, Neitlich et al. 2019). Cu is a potent phytotoxin, thus the zone of impact is likely to be larger than that at Red Dog.	
58	4.26.3	4.26-2	4	The duration of impacts would be considered permanent in locations where removal or disturbance to vegetation would occur during construction and remain free of vegetation through closure.	The duration of impacts would be considered permanent in locations where removal or disturbance to vegetation would occur during construction and remain free of vegetation through closure, as well as in areas where recovery could take decades (e.g., lichen, dwarf shrub-lichen, barrens and other habitats dominated or co-dominated by the extremely slow growing nonvascular components.)	Lichens are extremely slow growing and take decades to over a century to recover following catastrophic disturbance such as wildfire (Joly et al. 2010). Indeed, although former lichen habitat following fire has tended to be rich in graminoids, it has stayed low in lichen cover for more than 55 years, and is generally avoided by caribou for winter forage. Full recovery is estimated to take as long as 160 years (Black and Bliss 1978). There is a great deal of lichen habitat in the mine site area.	Joly, K., Chapin, F. S., and D. R. Klein. 2010. Winter habitat selection by caribou in relation to lichen abundance, wildfires, grazing, and landscape characteristics in northwest Alaska. Ecoscience 17(3):321-333. Black, R.A., Bliss, L.C., 1978. Recovery sequence of Picea mariana – Vaccinium uliginosum forests after burning near Inuvik, Northwest Territories, Canada. Can. J. Bot. 56, 2020–2030.
59	4.26.3	4.26-2		Reclaimed areas would be expected to return to the vegetative functions that were lost temporarily as a result of vegetation removal. Natural succession would be expected to take place in reclaimed areas. Vegetation reestablishment time varies; trees and shrubs would be expected to begin to re-establish almost immediately in disturbed areas after construction activities cease, and during and after reclamation activities. Alders (Alnus spp.), willows (Salix spp.), and birch (Betula spp.) are generally the first trees and shrubs to re-establish.	Reclaimed areas would be expected to return to the vegetative functions that were lost temporarily as a result of vegetation removal. Natural succession would be expected to take place in reclaimed areas. Vegetation reestablishment time varies; trees and shrubs would be expected to begin to re-establish almost immediately in disturbed areas after construction activities cease, and during and after reclamation activities. Alders (Alnus spp.), willows (Salix spp.), and birch (Betula spp.) are generally the first trees and shrubs to re-establish. Lichens may take decades to over a century to recover.	Lichens are extremely slow growing and take decades to over a century to recover following catastrophic disturbance such as wildfire (Joly et al. 2010). Indeed, although former lichen habitat following fire has tended to be rich in graminoids, it has stayed low in lichen cover for more than 55 years, and is generally avoided by caribou for winter forage. Full recovery is estimated to take as long as 160 years (Black and Bliss 1978). There is a great deal of lichen habitat in the mine site area.	
60	4.26.3	4.26-3	3	Fugitive dust emissions are a by-product of construction activities.	Fugitive dust emissions of both crustal and heavy metal fractions are expected to occur widely in the mine site and along all transportation corridors.	This is a major topic that receives only scant attention in this EIS compared to the large impact that has occurred at analogous mines such as Red Dog. At Red Dog, fugitive dusts bearing Cd, Pb and Zn dispersed for tens of kilometers from the mine site and haul roads and mosses showed elevated levels of heavy metals up to 40 km away from the sources (Neitlich et al. 2017, Hasselbach et al. 2005). To state that the dusts are only related to construction is to miss the key issue of impacts from operations, as demonstrated at Red Dog Mine for the last 30 years.	

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61	4.26.3	4.26-3	3	Windblown dust would potentially affect vegetation well beyond the source, but the effect diminishes with distance and is affected by prevailing winds and topography.	Windblown dust is likely to kill sensitive vegetation close to the emissions source and to reduce lichen cover and diversity out to at least 3000 m from the source. At greater distances, the effect diminishes and is affected by prevailing winds and topography.	At Red Dog, Exponent (2007) reports losses of lichen cover out to 2000m from the Red Dog Mine haul road due to Zn, Pb and Cd in fugitive dusts. NPS studies (Neitlich et al. 2019, DiMeglio et al. 2019) show effects out to at least 3000 m from the source including reduction of cover and diversity.	
62	4.26.3	4.26-3	4	Decreases in sphagnum and other mosses and lichens	Add: Elimination or drastic reduction of lichen cover, lichen diversity and bryophyte cover out to several kilometers from the sources.	At Red Dog, Exponent (2007) reports losses of lichen cover out to 2000m from the Red Dog Mine haul road due to Zn, Pb and Cd in fugitive dusts. NPS studies (Neitlich et al. 2019, DiMeglio et al. 2019) show effects out to at least 3000 m from the source including reduction of cover and diversity.	DiMeglio, E., McCune, B., Neitlich, P. N., and A. E. Shiel. 2019. Impacts of Heavy Metal Dust on Arctic Tundra Vegetation and Lichen Community Over Time. In prep.
63	4.26.3	4.26-3	6	The duration of impacts from fugitive dust is typically seasonal for the life of the project because dust is washed off of the vegetation surrounding the project during winter months (or when deciduous species lose leaves), or can occur throughout the duration of project activities.	The duration of impacts from fugitive dust is expected to last beyond the closure of the mine as service vehicles will continue to disperse dust over the long term.	While the levels of contaminants in fugitive dusts are likely to drop post closure, there will be continuing deposition from service vehicles and continuing effects due to the contaminants already present in the soil (Neitlich et al. 2017).	
64	4.26.3	4.26-3	7	The extent of fugitive dust is limited to areas adjacent to roads with vehicle traffic or in unpaved surface areas, and in the dust emissions areas, with the highest concentrations of dust closest to the source.	The sources of fugitive dust are primarily roads, concentrate loading and unloading facilities, and blasting activities. The dust is likely to travel for many miles and in this case is likely to enter Lake Clark National Park and Preserve, and McNeil River State Park, though concentrations of dust will be highest closest to the source.	The current phrasing is inaccurate. Fugitive dusts have dispersed contaminants out to at least 40 km from mine sources (Hasselbach et al. 2005, Neitlich et al. 2017).	
65	4.26.3	4.26-3	7	For example, vegetation directly along an access road would receive more dust than vegetation 15 feet away from the road when a vehicle drives by, because the dust would settle as it disperses from the road.	For example, vegetation directly along an access road would receive more dust than vegetation 1 mile away from the road when a vehicle drives by, because the dust would settle as it disperses from the road.	The current phrasing understates the extent of the problem. Fugitive dusts have dispersed contaminants out to at least 40 km from mine sources (Hasselbach et al. 2005, Neitlich et al. 2017).	
66	4.26.3	4.26-4	3	Pebble Limited Partnership (PLP) proposes to use covered containers to transport concentrate, essentially eliminating potential for concentrate dust.	Delete	At Red Dog Mine, the use of hydraulically covered trucks has reduced the contamination of the surrounding tundra from that of older tarp-covered trucks. However, dispersal of contaminants is ongoing. (Neitlich et al. 2017, Hasselbach et al. 2005). Vehicles of all kinds track ore concentrates up and down the roads continuously, and even passenger vehicles bear Pb levels of 10,000 mg/kg and 23,000 mg/kg Zn on their undersurfaces (Brumbaugh and May 2008). Over time, the road itself becomes contaminated and a source of ongoing emission (Brumbaugh et al. 2011). Containerizing the concentrate may help reduce spills, but will not address the problem of dust emissions.	Brumbaugh, W.G., and May, T.W., 2008, Elements in mud and snow in the vicinity of the DeLong Mountain Regional Transportation System Road, Red Dog Mine, and Cape Krusenstern National Monument, Alaska, 2005–06, U.S. Geological Survey Scientific Investigations Report 2008–5040, 30 p.
67	4.26.5.1	4.26-5	3	Table 4.26-1 lists acreages by vegetation type in the mine site area that would be affected by clearing, grading, and removal activities during construction.	Rework analysis.	Similar to comments in Affected Environment-Vegetation, this section (and all those following in the chapter) should be reworked to account for greater levels of specificity to sensitive habitats such as: Lichen, Dwarf Shrub-Lichen, Bareground, Dwarf Shrub. These are available in the same GIS layer as the aggregated classes used, however the more specific classes will give an indication of the nature of the impact on sensitive habitats that are most affected by fugitive dusts (Neitlich et al. 2017, Neitlich et al. 2019, DiMeglio et al. 2019).	

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68	4.26.5.1	4.26-6	1	Fugitive dust emissions are a by-product of construction activities.	Fugitive dust emissions are likely to occur from all roads or other areas of vehicle traffic, concentrate loading and unloading facilities, tailings storage facilities, waste rock dumps, and blasting activities.	This statement is true but misses the point that the dusts responsible for the majority of impacts are those generated by mine operations.	
69	4.26.5.2	4.26-6	4	The heaviest dust deposition would be anticipated to occur within 35 feet of the road (Walker and Everett 1987); however, dust has been documented at distances of 330 feet from the most heavily traveled roads in Prudhoe Bay (Walker et al. 1987).	The heaviest dust deposition would be within 100 m of the road (Neitlich et al. 2017), but elevated levels of contaminants are likely to be found out to 40 km from the roadway. The effects on vegetation are likely to be limited to 2000-3000 m from the road based on similar fugitive dust deposition at Red Dog Mine.	As drafted, this entire chapter under-estimates impacts because it analyzes a distance for crustal road dust dispersal--rather than heavy metal bearing dust. At Red Dog, background contaminant levels were not reached until 42 km from the haul road, and effects on vegetation extended out to approximately 3000 m. The analysis only captures about 4% of the actual area likely to be affected.	
70	Table 4.26-2	4.26-6	1	During construction, the magnitude and extent of fugitive dust impacts would be the deposition of dust from the mine over 3,007 acres of vegetation.	During mine operation, the magnitude and extent of fugitive dust impacts would be likely to extend out to 3000 m from all roadways and potentially 5000 m from the mine site, totaling XXXX acres.	The number of acres in the DEIS is severely underestimated for two reasons: 1) the analysis only includes the construction phase, which is of limited consequence to vegetation, and 2) the analysis limits the dispersal to 330 ft, rather than the 2000 m or 3000 m impact distances found at Red Dog mine (Exponent 2007, Neitlich et al. 2017, Neitlich et al. 2019, DiMeglio et al. 2019). This entire chapter needs to be reanalyzed with the new distances incorporated. As currently drafted, this analysis captures only about 4% of the actual acreage affected.	
71	Table 4.26-2	4.26-6	1		Vegetation Type should be reworked to account for types sensitive to impact from fugitive dusts.	As explained above.	
72	4.26.5.3	4.26-10	5	Fugitive dust emissions are a by-product of construction activities. No current development exists at the Amakdedori port site. Fugitive dust at this location would mostly be attributed to construction of the terminal. Because no construction would be required during operations, subsequent indirect impacts to vegetation from fugitive dust would likely be limited. With the exception of necessary infrastructure to support shallow-draft tug and barge access to the dock, onshore port facilities would be removed during closure.		Fugitive dust at Amakdedori port site will continue to be an issue after construction of the terminal. While the containerization of concentrate will help reduce the spread of contamination of the sort that occurs by handling of concentrate at the Red Dog port, this area will still receive contaminant inputs via vehicle traffic. These inputs will be emitted as fugitive dusts. (See Brumbaugh and May 2008 and Brumbaugh et al. 2011).	
73	4.26.5.3	4.26-10	6	In terms of magnitude and extent, during construction, a total of 84 acres of vegetation would potentially be affected by dust deposition from the Amakdedori port. The dominant vegetation types in this area are dwarf shrub and low shrub.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	

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74	4.26.6.2	4.26-12	3	For Alternative 2, magnitude and extent would be that 4,315 acres of vegetation would potentially be indirectly impacted by dust in the transportation and natural gas corridors.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	
75	4.26.6.3	4.26-14		In terms of magnitude and extent, during construction, a total of 45 acres of vegetation would potentially be affected by dust deposition from the Diamond Point port. The dominant vegetation types in this area are tall shrub and low shrub.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used.	
76	4.26.7.2	4.26-16		In terms of magnitude and extent, a total of 6,733 acres of vegetation would be indirectly impacted by dust in the transportation and natural gas corridors.	Needs reanalysis.	Same comments as for 4.26.5.2 in terms of affected area and habitat cover classes used. In addition, the terminus of the concentrate pipeline would result in additional contamination through the loading and unloading of uncontained bulk concentrate. This is likely to produce mine site-like conditions at this port site, leading to additional metals release both at the port and along the transportation corridor. The Red Dog port site is a highly contaminated facility due to the handling of bulk concentrate (Exponent 2007), and this has led to additional contamination of roadbed surfaces all around the port and on the haul road.	
77	4.26.8			Depending on the alternative, the magnitude and extent or impacts from project construction, operations, and closure at the mine site would be the removal of between 9,823 to 10,409 acres of vegetation	Needs reanalysis.	Same comments as 4.26.5.2	
78	4.26.9.2, 4.26.9.3, 4.26.9.4, 4.26.9.5, 4.26.9.6	4.26-20 to 4.26-22				As with the rest of this chapter, these sections should be reworked using dust dispersal distances from other mines (e.g., Neitlich et al. 2017, Hasselbach et al. 2005) rather than from Dalton Highway studies.	
79	Table 4.26-17				Needs reanalysis.	Same comment as 4.26.8	
80	4.27					The lack of marine current information prevents the proposal from adequately identifying potential marine downstream effects of the port facility development, general operations, or spill consequences to marine larval transport and development. It is recommended to included currents in the analysis.	
81	4.27					The DEIS lacks species and biological community assessments for any habitats and assemblages ‘downstream’ of port-related activities in lower Cook Inlet. The DEIS should address the duration and location of potential spills to allow for a full analysis of potential ecological consequences of contamination.	
82	4.27.2.2	4.27-7	Marine Tanker Vessels			The referenced Cook Inlet Studies of oil spill risk from tank barges release to be very small (Nuka and Pearson 2015) was not focused on the type of operation proposed in this DEIS.	

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83	4.27.4	4.27-33	Concentrate Spills	N/A	N/A	Katmai National Park and Preserve's northeastern boundary is located in close proximity to the proposed Amakdedori port location in Action Alternative 1. The port operations at this site include the transportation of concentrated ore materials by barge to lightering locations located off-coast. The method for transferring the concentrated ore materials from the barge containers into shipping freighters is concerning to the park. Containers will be opened at sea by having their tops removed, and then moved into position over the ship's cargo hold and dumped in. This process would allow for the fine concentrated materials to spill during high wind or high sea events. The amount of lost materials anticipated through the transfer process does not appear to have been included in the DEIS. With each container anticipated to hold 76,000 pounds of concentrates, even small amounts of materials spilled or lost during each transfer event would amount to a significant amount of pollutants being consistently deposited over time. Once these concentrated materials are introduced into Kamishak Bay, the prevailing ocean currents would bring contaminants directly on to the Katmai coast at the south end of Kamishak Bay, and dispersed pollutants would continue along the Katmai coast down the Shelikof Strait. The coast along Katmai National Park and Preserve is home to many ecologically sensitive areas including tidal marshes; which provide critical feeding opportunities for coastal brown bears, a species of significance for Katmai National Park and Preserve. Marine mammals that exist within the Kamishak Bay travel down Shelikof Strait and the Katmai coast and would be vectors that would distribute pollutants much further south than is estimated in the DEIS section on Spill Risk. Katmai requests that the effects of concentrate spills that occur as part of the transfer process during lighterings analyzed more fully in the EIS for this project.	
84	4.27.4.7 Concentrate Spill Scenarios; including Iliamna Lake Ferry Rupture, pipeline break, and Tailings Slurry Release etc.	PAGE | 4.27-43,PAGE | 4.27-57 and PAGE | 4.27-67 and	All stmts indicating ore spills into area waters would not result in acid generation, metals would not be mobilized, if there were impacts to aquatic life they would be short term, and sulfides would not oxidize in water.	"If spilled concentrate is promptly removed from impacted waterbody there will be no measureable leaching of metals" (pg 4.27-53) and similar optimistic statements throughout.		This section fails to consider actual risks to the world's most valuable subsistence, commercial and recreational sockeye salmon fisheries and the aquatic foodchains they rely on for survival from spills that can and do occur due to mining accidents. It also does not acknowledge: the low natural buffering capacity and high dissolved oxygen levels of area waters, which will facilitate acid formation and metals mobilization from spilled ore into the region's aquatic systems (see provided references). For example, Copper (Cu), the primary ore component, is highly toxic to aquatic life at levels just above that needed for life. Slight increases in dissolved Cu levels of just 2-10 ppb above natural baselines can impair salmonids ability to smell (e.g., home to natal stream for spawning), avoid predators, find food, identify kin or mates; it can also increase their susceptibility to disease, and increases of just 10- 20 ppb above baseline can be lethal. It can impact productivity of the entire food chain they rely on. Additional evidence should be provided to support the claim of no impact. Natural Cu levels in area waters are extremely low; Ore payload will likely be over 40% Cu and sulfides will be present, it is Potentially Acid Generating material. Combined with Zn which will be a component, Cu can act synergistically to be more toxic than either alone. Please consider references provided and integrate probable impacts- both lethal and chronic- to not just select fish, but to all subsistence species and their food chains. Additional empirical evidence via peer-reviewed scientific literature should be provided to support any conclusions indicating no impact, no downstream effect, no population level effect, or only localized effect. Suggest the analysis address the fact that Iliamna Lake turns over twice yearly (dimictic); thus if a spill goes into the lake, resuspension of metals can and will likely occur during that period. The lake is oxygenated, is neutral and not well buffered; therefore if an ore spill occurred in the lake or Newhalen River or Upper Talarik Creek, then significant potential lethal and long-term chronic effects on all the stocks that spawn and rear and migrate through those systems can be impacted. If a spill occurs in area running waters, it can cause immediate fatal impacts to the entire aquatic food chain in that system and far downstream depending on conditions, and then potentially cause long term chronic impacts from metals that will remain in the sediments, get passed up the food chain, and that can also be resuspended and moved further downstream during spring and fall floods from riparian zones and sediments. See list of appropriate references provided. Authors also suggest there is no oxygen in water and therefore sulfides would not oxidize resulting in metals dissolving and leaching from the ore to aquatic systems.	A quantitative analysis of potential risks regarding spills vs. a qualitative one, would be more appropriate . Consider existing empirical data of US/Canadian mines that have experienced spills, dam accidents, pipeline breaks and other failures into aquatic systems. Since that breach at Mt. Polley was caused, in large part, by "dislocation of the embankment due to foundation failure" (Mount Polley Independent Expert Engineering and Review Panel https://www.mountpolleyreviewpanel.ca/). What if spill concentrate can't be" immediately cleaned up" as claimed? Consider evaluating incidents in the Great Lakes for comparative purposes. Revised analysis and full disclosure of potential spill risks and impacts is warranted, considering both acute and chronic long term impacts.

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85	5.2.1.2	5-4	5	Using BMPs, such as revegetation planning, watering, and using dust suppressants to control fugitive dust.	Add: Conduct baseline sampling of moss tissue and soils in 50 mi radius of mine site (including in Lake Clark National Park). Conduct regular follow up monitoring.		
86	5.2.1.2	5-4		Applying industry-standard BMPs relating to invasive species prevention and management		The invasive species mitigations describes only the use of BMPs. Industry standards for preventing spread of invasive species have not been particularly successful. The DEIS should address how invasive species could arrive in the project area or how the project itself could potentially increase or facilitate their arrival or spread. This section should address the role disturbed colonizing surfaces have on providing opportunity for the spread of invasives, and how the road corridor, material sites, and all disturbed surfaces created by the project will be managed to prevent growth of invasives. The DEIS also does not address the substantial role that heavy equipment has in providing a vector for the movement of invasive species. The location of cleaning before any equipment is brought to the site should be identified, as should the required cleaning procedures and the inspection procedures. These procedures should be designed to ensure the project does not bring invasives into the project area or transportation corridor through transport of soil on the undercarriage of heavy equipment. Finally, the document should describe how the project will prevent the expansion of invasive species that do arrive, with special attention to how the open, colonizable surfaces in the transportation corridor and mine area will be managed to prevent invasives from taking hold.	
87	Table 5-2	Page 5-8	3	Implementing a fugitive dust plan would reduce the potential for releases of construction-related dust that degrade air and water quality and impact human health.	Implementing a fugitive dust plan would reduce the potential for releases of heavy metal-enriched dust that degrade air, soil and water quality, kill sensitive biota and impact human health.	Construction-related dust is not the primary issue with fugitive dusts. The key issue is the effects of the contaminant-bearing dusts released from mining operations.	
88	Table 5.2	5-19	2	Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry; and eliminates potential for concentrate dust.	Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry. Use of year-round vehicle washing stations at the exit of the mine site and any other heavily contaminated areas, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities will help reduce the emission of contaminant-bearing fugitive dusts.	The use of containers is a good spill prevention method, but it does little to prevent the spread of contaminants via fugitive dusts unless one is comparing containers to open haul trucks. Most of the contaminant-bearing fugitive dusts are dispersed via vehicle tracking onto road surfaces. Actions to reduce dust emissions include: year-round vehicle washing stations at the exit of the mine site, strong dust palliatives, and bag house containment for concentrate loading and unloading facilities (Exponent 2007, Neitlich et al. 2017)	
89	Table 5.2	5-19	2		Add: Procure contracts with native seed growers on the Kenai Peninsula to provide seeds and cutting stock for revegetating degraded or excavated areas in need of restoration.	If a supply of seeds and cuttings is arranged in advance, it will avoid the inevitable scramble for materials after a spill requires excavation and restoration.	

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1	**Sectn**	**Page**	**Parag**	**Original Text**	**Suggested Text**	**Comment**	**Additional References**
90	Table 5-2	Page 5-8	3	A Fugitive Dust Control Plan (FDCP) would be developed for the project and BMPs would be implemented for fugitive dust management.	Add: Heavy investment in operational controls for contaminant emissions at the outset will reduce the need to address a mushrooming problem of biological effects. Operational controls may include: Use of year-round vehicle washing stations at the exit of the mine site and any other areas with bulk ore and concentrate contact, pressure washing of concentrate shipping containers prior to trucking to the port and following emptying into the ship, strong dust palliatives on all road surfaces and TSF beaches, and bag house containment for concentrate loading and unloading facilities.	It is essential to get ahead of the fugitive dust-contaminants problem before it affects the ecosystem and/or subsistence foods and becomes a public relations issue. While funding is often scarce at the beginning of the project--before minerals are being sold--it is precisely at the beginning of the project that these controls are most needed. Once the dust issue gets away from the mine operator, the costs skyrocket and the public relations suffer terribly. This DEIS has greatly minimized the fugitive dust issue.	
91	All					Lake Clark National Park and Preserve protects a tapestry of cultural places woven from 10,000 years of human occupancy that is vital to the cultural and spiritual continuance of the people who live there. The people of the Lake Clark and Lake Iliamna region have lived there for centuries. They have developed a unique culture that evolved from the environment. This way of life supports health and well-being and is directly and completely dependent on an intact ecosystem. The entire ecosystem is cumulative and interconnected; what happens to one part will affect all others. Therefore, the impact of a large open pit mine, possibly the world's largest, is much more than a footprint. Land animals, birds, and fish do not stay in one place; they interact at multiple levels influenced by seasons, time and space. For example, the caribou migration route, calving grounds and habitat loss will be directly affected. These changes causing "adaptive approaches" will affect the environment and a way of life. Project proponents need a clear understanding of the subsistence dependent lifestyle of the local people. Their knowledge base dates back centuries and has evolved through a system of learned experience, through direct observations and through trial and error. This is no different than a scientist conducting a study by collecting data and measuring the outcome. The primary difference is the latter is written down, is determined as factual, and has a much shorter study period. To understand and comprehend these impacts more effectively it is necessary to address this at multiple levels. Working directly with local communities and looking at case studies relating to the lifeway and connection to the environment and food sources and understanding what Traditional Ecological Knowledge means can provide a more solid and tangible starting point. Social and environmental impacts pose a direct threat to a cultural people's way of life, livelihoods and to key cultural and spiritual sites. No matter how much the potential damage is minimized in the development of an open pit mine, there is no guarantee that the damage will not affect the region nor the traditional way of life of the people. The traditional cultural values, worldview, and way of life does not align with the proposed mining development.	
92	Appendices			The draft project lighting plan was not included in the DEIS.		Please submit a draft lighting plan for comment. Modeled impacts to natural lightscapes in Lake Clark NP&P and Katmai NP&P are significant in the DEIS and in the Dark Sky Partners, LLC 2019 report. Project lighting impacts can be reduced substantially if mitigation elements are incorporated into the lighting design. Lighting impact mitigation techniques, which have the added benefit of reducing energy costs, are described on the NPS Night Skies website at www.nps.gov/subjects/nightskies/practices.htm, and in the Dark Sky Partners report.	Dark Sky Partners LLC 2019 (provided to USACE)

	A	B	C	D	E	F	G
1	**Sectn**	**Page**	**Parag**	**Original Text**	**Suggested Text**	**Comment**	**Additional References**
93	K 3.1	K3.1-1 - 1-5	All			In Appendix K of the EIS, Section K3.1, offers some examples of TEK regarding subsistence uses in the study area. These are taken from the Environmental Baseline Document done in 2011, which included tables, charts and maps derived from surveys and interviews, or from an EPA study of TEK in the EPA watershed assessment (2014) based on interviews in the region in 2013. Other information said to qualify as TEK was taken from review by cooperating agencies or from tribal consultation. The examples are statements about fish, animals and other resources on the lands proposed for development. There is little cultural context and in many cases seem more like recent observations than TEK passed down over generations. If the EIS intends to recognize all the impacts of the proposed project on sociocultural dimensions of subsistence, it must more fully incorporate possible interruptions and discontinuities in implementation and transmission of TEK.	
94	K4	4.1.3	All			The DEIS states that it includes consideration of reasonably foreseeable future actions including exploration and development of prospects outside of the immediate study area were included in the analysis. However, that analysis includes cumulative impacts solely to the watershed already directly impacted by the proposed mine. Improved access to some of these remote deposits may make them more economically viable and even though some are beyond the currently evaluated watershed, the cumulative impact analysis should include reasonable foreseeable impacts to these associated watersheds with regards to both surface water and groundwater. The limitation of reasonably foreseeable actions to only include those with existing development plans or are in the permitting process does not adequately capture the RFFAs.	
95	K4.18.2	entire section		At issue are predicted water volumes for treatment and constituents that must be removed to ensure life is protected.	Needs further documentation, references, study.	The DEIS discusses the verly large volumes of water that will need treatment, up to 30 cfs or up to 14,363 gallons per minute, and the volume of potentially toxic elements that will need to be removed (Hg, Pb, Cl, Zn, Se, etc.). Please provide references, documented empirical studies, example mines, where this volume of mine wastewater capture and treatment has been successfully attained.	
96	Appendix N		Section on treatment and removal of selenium			Selenium (Se) is a necessary nutrient, but at very low levels, above that needed for life, it becomes toxic. It can cause deformities in fish and is passed up the food chain and bio-concentrated from algae to insects to fish, etc.; it is also passed on from females to their offspring via eggs. Selenium would present a significant risk to aquatic life and subsistence resources across a potentially wide area if not controlled. The DEIS presents various methods for treating Se; however, none have ever been shown to be effective in Alaska's cold climates or for such large predicted volumes of water as will occur at Pebble. SRK predictions for Se concentrations in water discharged to the mine water treatment plant from various sources are often orders of magnitude above protective aquatic water quality criteria of 5 ug/L; for example: open pit wall run-off (acid generating) are predicted to be 130 ug/L; tertiary waste rock is predicted at 22 ug/L; and total load from just the potentially acid generating waste rock, which is about 41% of the facility area, is estimated to be 41 kg/yr (all data from SRK 2018 Geochemical source terms for water treatment planning, Pebble Project. SRK for Table 4 see pg. 20). The modeled outflow concentration of Se is 5 ug/L, which leaves little room for error, as the predicted discharge concentrations are equal to the ambient water quality standard. The predicted Se pretreatment concentrations described above are orders of magnitude higher than naturally occurring levels documented in the Koktuli Rivers and Upper Talarik Creek (Se median=0.31 ug/L; PLP EBD Water Quality data 2004- 2009). Red Dog Mine has had difficulty controlling selenium, and the issue at Pebble could potentially be larger. More information is needed on exactly how the orders of magnitude higher levels of Se will be treated and removed prior to release; we recommend including this information in the revised DEIS. Given the lack of proven methods for treating Se, the NPS notes that if the treatment methods used are not sufficiently effective, output would exceed water quality standards.	

Enclosure 3: U.S. Fish and Wildlife Service Recommended Mitigation Measures for Inclusion in the Pebble Limited Partnership Draft Environmental Impact Statement and Management Plans

Recommended Mitigation Measures

Avian Species and Habitat Measures

- Avoid fragmenting large, contiguous tracts of intact habitat, especially if habitat cannot be fully restored after construction.
- Co-locate activities into disturbed areas to the maximum extent practicable to reduce disturbance of migratory bird habitat.
- Clear natural or semi-natural habitats outside the nesting season. Please refer to the Service's "Timing Recommendations for Land Disturbance and Vegetation Clearing" for nesting season recommendations by habitat type and region. (https://www.fws.gov/alaska/fisheries/fieldoffice/anchorage/pdf/USFWS%20Timing%20Recommendations%20for%20Land%20Disturbance%20&%20Vegetation%20Clearing.pdf).
- Minimize prolonged human presence near nesting birds during construction and maintenance actions.
- Instruct all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service webpage on regulations and policies (https://www.fws.gov/birds/policies-and-regulations.php).
- Prior to removal of an inactive nest, ensure that the nest is not protected under the ESA or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA should not be removed without a valid permit.
- Do not collect birds (live or dead), their parts (e.g., feathers), or nests without a valid permit. Further information on permits and permit applications may be found on the Service permits page. (https://www.fws.gov/permits/applicationforms/ApplicationLM.html#MBTA).
- Report any intentional take of non-game migratory birds to the local Service Office of Law Enforcement (https://www.fws.gov/alaska/law/index.htm). Direct, intentional take of migratory birds is not allowed under the Migratory Bird Treaty Act; the Service recommends project proponents voluntarily minimize incidental take associated with their projects.
- To reduce bird collisions, place transmission lines associated with the development underground, where possible.
- If overhead lines are used, site them away from areas used by high numbers of birds crossing between roosting and feeding areas, or between lakes, rivers, and nesting areas. Orientation of power lines relative to biological characteristics (e.g., flight behavior, season, habitat, and habitat use) and environmental conditions (e.g., topographical features and weather patterns) can influence collision risk.
- If overhead powers are sited in migratory bird habitat, attach bird flight diverters (flappers) or related deterrent devices that are durable and visible to reduce collision risk.
- Lights should be down-shielded and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe

nighttime access to the site. Security lighting for on-ground facilities and infrastructure should be motion detective or heat-sensitive types of lighting.

Fish and Aquatic Resources Measures

- In order to not constrict the natural channel and to allow connectivity of the floodplain, at minimum, stream crossings should meet the Service and U.S. Forest Service Guidelines, which can be found at: https://www.akfishhabitat.org/ and https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054564.pdf.
- We recommend that stream crossing designs use bridge structures and appropriately sized culverts to maintain hydrology, allow natural stream and river channel processes, and provide passage of all fish species and life stages, whenever possible. Culverted stream crossings should be composed of an arch or oversized culvert at minimum of 120 percent of the channel width measured at ordinary high water mark.
- Climate projections should be considered when designing road culverts to ensure velocity barriers from increased winter streamflow are avoided, and changes in the timing of life history events should be considered when formulating timing windows to protect sensitive life stages.
- To maintain downstream flow of the natural hydrograph and avoid bank erosion or channel incision, when working in streams, mimic the constructed stream channel shape with the instream channel features above and below any stream diversion (e.g., slope, bends, pools, riffles, glides, large rocks).
- Avoid construction in areas of upwelling and downwelling in streams. These areas provide important wetland functions, filter nutrients, provide for movement of aquatic organisms, and water exchange in feeding, rearing, and refugia habitats.
- Site facilities away from waterbodies. Maintain a vegetated riparian stream buffer zone of at least 50 feet to retain natural bank-stabilizing vegetation, maintain the floodplain, improve water quality, and promote terrestrial invertebrate and nutrient inputs.
- Use erosion control measures such as silt fences, silt curtains, and cofferdams to trap and prevent sediment and pollutants from being transported into surrounding waterbodies (lakes, streams, wetlands, coastal waters, temporary diversion channels, etc.).
- We recommend that streambank restoration incorporate bioengineering techniques (e.g., root wads, bundled water tolerant willows), where possible, to maintain natural velocities, prevent bank erosion, and promote healthy riparian system functions that are important to aquatic species.
- Use screened intakes for water withdrawals to avoid suction entrapment and entrainment injury to small and juvenile fish that may be present. For additional information on screening criteria for various species and life stages of fish as well as methods for design and fabrication of cylindrical water intakes, see Alaska Department of Fish and Game (ADF&G) Habitat Division Technical Report No. 97-8 (PDF 2,558 kB). http://www.adfg.alaska.gov/static/license/uselicense/pdfs/97_08.pdf
- Where possible, avoid disturbance in areas of eelgrass and kelp growth, which provide rearing and refugia habitat for a wide variety of species.
- For docks and access ramps, use light-penetrating materials to protect vegetation (board spacing of 0.5 inch or more is preferred over water) to allow sunlight penetration for

vegetative growth (i.e., grasses, sedges, shrubs, and trees) and vegetative bank stabilization provided by plant root.
- Use piling-supported structures, rather than fill, for shoreline developments such as dock approaches, building surfaces, or marine storage areas. Piling-supported structures allow continued use of marine habitat by a variety of fish as well as invertebrates, birds, and mammals, including scavengers and predators.

Spill Avoidance Measures

- To reduce impacts to fish and aquatic life from potential spills, maintain a minimum 200-foot setback from waterways when storing hazardous or toxic material, and stage oil-spill response equipment (i.e., containment booms) adjacent to vulnerable fish-bearing wetlands, streams, and rivers during major construction activities.
- Ensure that secondary containment is provided for the storage of fuel or hazardous substances and sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR 112.
- During fuel or hazardous substance transfer, ensure that a secondary containment is placed under all inlet and outlet points, hose connections, and hose ends.

Invasive Species Measures

Terrestrial

- Identify locations of known invasive plant infestations. Plan activities accordingly to avoid infestations.
- Use certified weed-free materials, including gravel, topsoil, hay/straw, or erosion control tubes, especially when working near sensitive habitats such as streams and wetlands.
- Revegetate bare soils with native plants as soon as feasible to minimize the possible establishment of invasive plant species.
- Clean vehicles and equipment regularly to remove dirt, vegetation, and seeds. Wash equipment at the same location, and if contaminated, treat for invasive species as necessary.
- Avoid cleaning equipment in or near waterways or wetlands, which are particularly sensitive to invasion and which could result in changes to aquatic organism habitat/function.
- If working in infested areas, time disturbance activities so that they occur prior to the plants setting seed. Contact UAF Cooperative Extension Service or the Department of Agriculture (http://plants.alaska.gov) for timing information if you are unsure.
- Coordinate with local village or other groups in the project area to identify locations and opportunities to collaborate efforts to minimize invasive infestations.

Aquatic

- Use control measures to reduce the potential for spreading invasive organisms. Hull fouling organisms like barnacles, mussels, sponges, algae, and sea squirts attach themselves to the hulls of ships, fouling these wetted hull surface areas. These organisms

then colonize the hull and "hitch a ride" from one port or bioregion to the next. Invasions can occur when these fouling organisms come in contact with structures in a new port or release their larvae into its waters, possibly establishing themselves in the new port and spreading to nearby areas within that bioregion.

- Inspect boats, trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.
- Clean, drain, and dry everything that comes into contact with water (boats, trailers, equipment, clothing, boots, waders, etc.) before transporting it to new waters; rinse, if practicable, with hot clean water.
- Drain water from motor, live well, bilge, and transom wells while on land before leaving the vicinity.
- Exchange ballast water in mid-ocean to control the unintentional introductions of invasive species. Exchange water at distances greater than 200 nautical miles from shore, and in waters greater than 1,640 feet deep.

Floatplanes, if used

- Inspect floatplanes and remove weeds from floats, wires, cables, water rudders, and pump floats.
- Avoid taxiing through heavy surface growths of weeds before takeoff. Raise and lower water rudders several times to clear off plants.
- If weeds are picked up during landing, clean off the water rudders before take-off. Upon takeoff, raise and lower water rudders several times to free weed plant fragments while over original body of water or over land. If weeds remain visible on floats or water rudders, return to waterbody and remove plants.

Habitat Protection Measures

- Construct the project with eventual reclamation in mind. Avoid wetlands, or at least higher-functioning/value wetlands, avoid construction in sensitive soils (e.g., highly erosive soils, thaw-stable and thaw-unstable permafrost), and reduce permanent habitat modification by restoring wetlands to pre-existing condition (hydrology, grade, vegetation).
- Plan to sequence construction activities such that existing surface vegetation can initially be removed, followed by grubbing roots of trees (unless whole trees are needed for root wad work in stream restoration), and finally blading remaining organic and topsoil layers for stockpiling for reclamation.
- Salvage the maximum amount of organic material and topsoil (henceforth, jointly referred to as topsoil) practicable, sign it, and store it separately from other overburden for use during reclamation. Often the organic and topsoil layers are difficult to distinguish; if that is the case or if topsoil is limited, salvage the uppermost 6 inches of the soil profile (DNR 2009).
- Plan to sequence mining so that topsoil can be directly hauled from the salvage location to a site prepared for reclamation, when practical. Direct hauling increases the viability of native seeds in the salvaged topsoil by allowing them to begin reestablishment as soon as site conditions permit. It also minimizes transportation costs.

- If topsoil is stored for more than one growing season, redistribute the topsoil over cut and fill areas, around outer boundaries of facilities, embankments, and drainage ditches to keep it viable.
- When redistributing topsoil, spread it to a uniform and stable thickness and prevent it from becoming compacted or eroded by wind and water until vegetation is established.
- If topsoil would not be spread for use in interim reclamation and would not be used within the first year, it should be placed on a stable area, labeled as topsoil, left undisturbed, and protected from the elements by seeding it with an interim seeding mix (DOT&PF 2016).
- Interim seeding, using native plant seed, may be necessary to keep topsoil viable, control erosion, reduce surface runoff, and maintain other habitat characteristics.
- Slopes should be contoured to blend with surrounding topography; consider using waterbars or contour furrowing on steeper slopes (DOT&PF 2016).
- Consider strategically placing root wads, large logs, or rocks after seeding to provide topographical relief and microclimates and to increase the variety of plant species difficult to establish by seed (e.g., increase habitat complexity).
- During final reclamation, after final grading and before replacing topsoil and other segregated materials, the regraded land should be ripped to promote root penetration.
- Create surface roughness to help control surface water runoff and reduce sedimentation (DOT&PF 2016).
- Use native weed-free seed (preferably locally collected), specific to the habitat type, applied at specified rates, and cover the seed to specified depth. See the Alaska Department of Natural Resources, Division of Agriculture and the Alaska Plant Materials Center for recommendations (DNR 2018a).
- Vegetative cover should be capable of stabilizing the soil against erosion. Consider use of tackifiers, mulch, or other bonding agents to keep seed in place (DOT&PF 2016).
- To minimize wildlife entanglement and plastic debris pollution, we recommend the use of plastic-free erosion and sediment control products such as netting manufactured from 100 percent biodegradable, non-plastic materials such as jute, sisal, or coir fiber. Plastic degradable netting is not recommended for use in erosion control for any aspect of the proposed project. Prior to degradation, the netting can entangle wildlife, including amphibians, birds, and small mammals. In addition, because the plastic netting is degradable (not biodegradable), once the plastic does degrade (which takes many years, especially in cold climates), it does not decompose into biological components of the soil. Instead, the plastic degrades into small fragments which are blown or washed into waterways creating a toxic ingestion hazard for aquatic wildlife for many years.

Monitoring Measures

- Baseline water quality and biological surveys should be conducted before the project begins. We recommend establishing these baseline levels in multiple streams/reaches immediately adjacent to the mine site, in several locations and at several distances downstream of the mine site in both the Nushagak and Kvichak watersheds, at Lake Iliamna both at the proposed ferry port locations and at the outflow from Tularik Creek, and along a sample of the streams that would be crossed by the transportation corridor.

- To detect changes to water quality and its effects to fish and wildlife, water quality should continue to be monitored until the mine reclamation is complete. We recommend conducting annual water sampling at all of the same locations as listed for baseline monitoring above. An annual report detailing the results of this sampling should be provided to the USACE and resource agencies.
- We recommend that reclamation plans include clear goals with measurable objectives and performance standards and discuss all phases of development to include interim and final reclamation. Depending on the phase of development during interim or post-operations reclamation, data collected should include the following:
    - Ground cover (composition and density), including plant cover with percent of desirable species and variety of desirable species, percent no cover (bare ground), and the percent and type of invasive species (see conservation measures for Invasive Species).
    - Streambank and wetland stability.
    - Channel monitoring to determine diversity of aquatic species - may be counted by species or trophic groups (forage fish, juvenile, nursery, piscivorous).
    - Measurement of erosion control success (evidence of rilling, gullies, rutting, slumping, etc.).
    - Evidence of wildlife use, tracks, scat, nests, etc.
    - Photo documentation.
- We recommend that reclamation monitoring be conducted for all phases of development during construction, operations, and final reclamation.
- We recommend that reclamation monitoring plans include nearby reference sites to provide ongoing information through data collection and photographic stations (DNR 2018b). Reference sites should be nearby and have similar conditions to provide comparable information about environmental conditions (e.g., elevation, topography, species composition, hydrologic function, precipitation).
- Collection of data should be conducted in late summer or early fall during peak plant production. The same data should be collected at both the control/reference sites and the disturbed sites (DNR 2013). The reference sites should be used to gauge the success of reclamation at the project site considering surrounding environmental conditions. Reference sites would also help to determine if the project site is on a trajectory to meet desired objectives or if adaptive management strategies such as re-planting, invasive species management, additional erosion control measures, or other remedial actions may be necessary.

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