Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		MITIGATION MEASURES	
Require specific wildlife awareness training for drivers operating in the area.	Wildlife Values; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. Worker awareness training is often required by operators for contractors. Pebble Limited Partnership's (PLP's) Wildlife Interaction Plan would be developed during feasibility design work to support state permitting, and would include education and training for project personnel and contractors (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Install sensors to detect and warn drivers of wildlife near roads.	Wildlife Values; Health and Safety	1. Effective—Yes. Radar detection would likely be the most effective detection system for large animals. Radar also provides information on the speed and volume of traffic. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Although the initial cost would be high, the economic feasibility is typically based on the benefits of avoiding vehicle damage and human injuries/deaths. The benefit of avoiding wildlife mortality would also be a factor.	Possible
Winter management of snow berms along roadways should include periodic breaks or cleared areas in snow berms to allow wildlife to get off the road during the approach of oncoming vehicles.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction— Lake and Peninsula Borough (LPB). 3. Reasonable—Yes. If snow berms are expected to be high enough to prevent escape.	Probable
To improve the effectiveness of the dust control plan, state within the Conceptual FDCP that an operations and maintenance plan will be developed and implemented prior to construction. The O&M plan should include key aspects such as: 1) More stringent commitments regarding implementation; 2) Set cut points for plan activation (e.g., after x days without rain/snow, or upon detection	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety	1. Effective—Yes. The additional specification would improve the effectiveness of the dust control plan. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes	Probable

EPA-6692-0003202

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
of dust plumes); 3) An indication of when the filter baghouse would be operated (e.g., year round); 4) A list of staff positions responsible for each measure, and a way to contact them. (this would appropriately include a list of staff positions that can trigger a dust control measure); and 5) A specific list of training (e.g., who gets trained, and to what level).			
Use dust palliatives (i.e., substances applied to a road surface) to reduce airborne dust.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. PLP's Fugitive Dust Control Plan (FDCP), to be developed during feasibility design work to support state permitting, would address controlling fugitive dust from site activities and wind erosion. PLP has specified that the control measures could include speed limits, use of approved chemical dust suppressants, and application of water (see Chapter 5, Mitigation, Table 5-2).	Possible
Use chip seal on surfaces to reduce airborne dust.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sties	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Other technically and economically feasible dust control measures would be just as effective at reducing impacts.	Unlikely
Post/enforce lower speed limits for drivers and project roads to reduce driving hazards and the potential effects of airborne dust on air and local water quality and human health.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Signs/notices are feasible. It is likely enforcement would be primarily the responsibility of PLP.	Possible
Develop a quieter ferry to reduce impacts and water disturbances on the lake and affects to wildlife.	Noise; Wildlife Values	1. Effective—No. PLP has proposed using diesel electric propulsion for the ferry to reduce noise impacts and reduce emissions.	Unlikely

EPA-6692-0003203

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Technology is beyond what has already been tested and may not be available.	
Bury the pipeline below the seafloor to prevent creating a barrier to crab movement.	Fish Values	1. Effective—Potentially. However, the 12-inch-diameter pipeline would not have population-level effects on crab movement. 2. Potential Jurisdiction—State of Alaska; USACE; Bureau of Safety and Environmental Enforcement (BSEE). 3. Reasonable—Partially. The pipeline would be buried over most of the Cook Inlet traverse, except for an approximately 11-mile-long segment southeast of Augustine Island (Owl Ridge 2019b). It is not reasonable to bury the pipeline along the entire Cook Inlet crossing because it is not supported by the effects analysis (i.e., such a small pipeline is not expected to be a barrier for crabs).	Unlikely
Build a moveable bridge for open ice snowmachine passage across Iliamna Lake during the winter.	Transportation and Navigation; Health and Safety	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. A moveable bridge would be complicated and potentially dangerous to deploy on a daily basis after the ferry passes. PLP has committed to marking a trail around the open lead on each end of the lake.	Unlikely
Where access road intersects existing trails, provide bridged or culverted underpasses or overpasses depending on level of trail use and trail, road and terrain elevations.	Transportation and Navigation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable— Potentially. These measures are shown to add to public safety in areas where high-use trails intersect with high-use roads. However, the amount of truck traffic predicted by the project is relatively low. Except in cases of no visibility (from curves or vegetation), proper trail marking and vegetation clearing would provide crossing safety.	Possible
Pave the mine/port access roads to reduce dust.	Air quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Measures identified in PLP's Conceptual FCDP are reasonable to reduce impacts associated with fugitive dust.	Unlikely

EPA-6692-0003204

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Measure hydrocarbon concentration and related compounds in surface and groundwater during the periodic water quality monitoring events.	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Probable
Consider mitigation banks and in-lieu fee programs as forms of compensatory mitigation.	Wetlands and Other Waters/Special Aquatic Sties	1. Effective—Yes. 2. Potential Jurisdiction—USACE. 3. Reasonable—No. The project is not in the service area of an approved bank or in-lieu fee program with appropriate credits available.	Unlikely
For compensatory mitigation, evaluate inactive mines to see if there are orphan mine sites with no viable financially responsible party and determine if they provide mitigation opportunities. Additional orphan mine sites can be found outside the immediate watershed. Possible hard rock and placer sites in the immediate watersheds surrounding Pebble Mine include: • State land sites - Shot, Synneva (Scynneva) Creek, and Bonanza Creek. • Federal land sites - Red Top, Unnamed (near tributary to Arcana Creek) and Monk's Hood.	Wetlands and Other Waters/Special Aquatic Sties	1. Effective—Potentially. Further investigation needed. 2. Potential Jurisdiction—USACE. 3. Reasonable— Potentially. Further investigation needed.	Possible
Avoid discharging bilge water into Iliamna Lake or contain and treat bilge water to remove more than oil before discharging to protect lake ecology.	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—US Environmental Protection Agency's (EPA's) Vessel General Permit (VGP) is currently the mechanism by which treated bilge water discharges are regulated; this authority will transfer to the US Coast Guard (USCG) in the next few years under the Vessel Incident Discharge Act (VIDA) of 2018. 3. Reasonable—Yes. PLP committed to collecting ferry bilge water in holding tanks at the ferry terminals and transporting to	Adopted by Applicant

EPA-6692-0003205

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		one of the water treatment plants located at the mine site or Amakdedori port (see Chapter 5, Mitigation, Table 5-2).	
Construct and assemble the ice-breaking ferry at an alternate location to allow for naval architectural oversight and engineering support.	Transportation and Navigation	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. If constructed and assembled at an alternative location, the ferry would be too large to transport to Iliamna Lake. The ferry would require naval architecture oversight and engineering support regardless of construction/assembly location.	Unlikely
Construct the natural gas pipeline in the winter to reduce environmental impacts.	Surface Water Hydrology; Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Not for the project. PLP proposes to co-locate the natural gas pipeline with the road to minimize impacts. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—No. The extra expense is not supported by the effects analysis for the project. The pipeline would be installed in the disturbed area for the road for most of the pipeline corridor and PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) outlines short-term and long-term restoration objectives for restoring temporarily impacted areas to a condition that resembles the pre-construction condition or that of adjacent lands undisturbed by the project.	Unlikely
Design culverts with software that can better predict stress and deflection in heavily loaded, complex soil structures, and interaction-dependent culvert structures.	Soils; Water and Sediment Quality; Fish Values; Surface Hydrology	1. Effective—Potentially~~, but not supported by the effects analysis~~. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially~~No~~. ~~This measure is beyond what the Alaska Department of Fish and Game (ADF&G) requires for permitting and approval of culverts.~~ Road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria but would require modern design for state permitting of culverts and bridges.	Possible~~Unlikely~~
Design the open span of all water crossings to be 1.5 times the stream width at ordinary high water, with abutments placed in uplands.	Water and Sediment Quality; Surface Hydrology; Fish Values	1. Effective—Yes~~Potentially, but not supported by the effects analysis~~. 2. Potential Jurisdiction—State of Alaska; potentially USACE.	Possible~~Unlikely~~

EPA-6692-0003206

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		3. Reasonable—PotentiallyNo. ~~This measure is beyond what the ADF&G requires for permitting and approval of culverts.~~ Road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design. ADF&G has indicated that they do not formal design criteria but would require modern design for state permitting of culverts and bridges.	
Establish flight restrictions (e.g., elevation, no-fly zones) to reduce caribou hunting impacts.	Wildlife Values; Subsistence	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. In many cases it may be reasonable to avoid flying over caribou and/or hunters at low altitudes. PLP has committed to employing protocols to ensure that helicopters and fixed-wing planes do not harass wildlife (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Develop a detailed construction noise mitigation plan, including scheduling of noise-producing activities, the proper design and implementation of practical and site-appropriate noise-reducing measures, and sound level monitoring to check for compliance with the outdoor EPA guidance threshold, to help minimize the magnitude of construction noise.	Noise	1. Effective—Yes. 2. Potential Jurisdiction—The Kenai Peninsula Borough has noise ordinances for material sites that may be applicable. 3. Reasonable—Potentially. A noise mitigation plan would be feasible, although monitoring may not be.	Possible
Provide automatic isolation valves and leak detection systems for the concentrate pipeline variant under Alternative 3- North Road Only, and the tailings delivery pipelines at the mine site under all alternatives.	Soils; Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. Would enable a quicker response to pipeline incidents. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Technology exists for automatic valves with pressure transducers to detect a pipeline rupture and shut off the flow.	Possible
Consider alternatives to the effluent outfall locations identified in the project that could reduce impacts (e.g., further reduce dewatering impacts).	Water and Sediment Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Alternative locations were not identified during the National Environmental Policy Act (NEPA) process. There are additional opportunities to modify locations	Possible

EPA-6692-0003207

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		post-NEPA; notably during design and State of Alaska permitting.	
Provide a double liner system under the pyritic tailings storage facility (TSF) and main water management pond (WMP).	Water Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Not likely. PLP has proposed that these facilities would be reclaimed after the proposed 20 years of mining, and the liner systems removed and disposed. PLP has also demonstrated that groundwater containment would be achieved should the liner system leak.	Possible
End-dump PAG waste rock in pyritic TSF in lifts smaller than 20 feet to minimize the risk of liner damage (AECOM 2018k).	Water and Sediment Quality, Spill Risk	1. Effective—Potentially. Would have less impact on liner integrity, although liner would have a layer of liner protection (sand and gravel). 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. May add to overall waste rock placement time, slow other activities, and increase fuel usage.	Possible
Revisit liner defect assumptions at pyritic TSF and main WMP based on final liner design and specifications; and update groundwater, water balance, and water quality model predictions in final design.	Water and Sediment Quality, Groundwater Hydrology	1. Effective—Yes. Would provide updated predictions of water quality inputs to water treatment plans. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Probable
Install deep continuous drains around the perimeter of the main WMP (instead of monitoring/pumpback wells) to intercept potential seepage (AECOM 2018k).	Water and Sediment Quality, Groundwater Hydrology	1. Effective—Possibly. Continuous drains could minimize the risk of liner leakage migrating in between monitoring/pumpback wells; further modeling analysis would be needed to evaluate whether continuous drains would perform better than wells. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Possibly. Continuous drains would likely be less cost-effective and have additional footprint impacts.	Possible
Consider back-filling the mine pit with additional bulk tailings material to reduce or eliminate impacts to geology during the post-reclamation period.	Geology	1. Effective—Yes. Would stabilize the exposed pit slopes by buttressing them; however, major geology impacts are not expected. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Would facilitate grading and closing the bulk TSF into a landform that could result in de-listing of the main and south embankments as jurisdiction dams. However, hauling tailings from the bulk TSF to the pit would be a major	Possible

EPA-6692-0003208

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		effort that is likely not reasonable from economic and safety standpoints.	
Incorporate measures to deter birds from the pit lake and other process water ponds; such as active hazing (boat and/or drone) or other deterrents. Waterfowl and other birdlife should be prevented from using standing water that does not meet water quality standards (i.e. metals, acidity, etc.) in mine pits, tailings ponds or other retention ponds for as long as water does not meet water quality standards.	Wildlife Values	1. Effective—Yes. Active hazing can prevent bird use of waterbodies or limit the amount of use. 2. Potential Jurisdiction—US Fish and Wildlife Service (USFWS); potentially State of Alaska. 3. Reasonable—Potentially. Modeling suggests that surface water would not be acutely toxic to birds. PLP would be required to monitor the water quality of the pit lake in closure and post-closure. ~~It would not be reasonable to require active hazing if the surface water is not toxic.~~	Possible
Build at least three sanitation facilities along the transportation corridor.	Needs and Welfare of the People-Socioeconomics; Land Ownership, Management, and Use	1. Effective—No. There would be sanitation facilities at the ends of each road segment and the roads are less than 40 miles in length. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Constructed sanitation facilities are unnecessary for project-related activities (assumes portable toilets would be used for construction/maintenance projects along the corridor).	Unlikely
Create a borough service area to include the mine site and allow access to mine site services (e.g., landfill and incinerator) for nearby residents.	Needs and Welfare of the People-Socioeconomics; Land Ownership, Management, and Use	1. Effective—No. A mine site safety boundary has been identified by PLP as the minimum area needed to safely conduct mine construction, operations, and reclamation (PLP 2018 – RFI 058). 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Mine operations could not accept unregulated waste over which they have no control. The project would provide revenues to the borough, allowing local government to provide these services as needed.	Unlikely
Build two public campgrounds with sanitation facilities.	Recreation	1. Effective—No. It is not clear what project impact this would mitigate.	Unlikely

EPA-6692-0003209

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. The project would provide revenues to the borough, allowing local government to provide these services if requested by the community.	
On closure and flooding of the open pit, stock with fish for recreational purposes.	Commercial and Recreational Fisheries	1. Effective—No. More desirable recreational fishing opportunities are abundant in the region. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Pit access would be controlled for safety reasons during post-closure so there would be no legal access.	Unlikely
Develop a mitigation plan to help villages and people with energy resources (i.e., subsistence resources) that would be affected by the project.	Food and Fiber Production; Subsistence	1. Effective—Potentially, but not supported by results of impact analysis. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. However, PLP has already committed to the establishment of a Local Advisory Committee, which could serve as a venue to address any concerns regarding subsistence.	Unlikely
Develop a subsistence plan documenting subsistence harvest levels during construction and operations of the project. The goal would be to monitor potential impacts to subsistence and implement adaptive management strategies as needed to support sustainable levels of subsistence harvest.	Food and Fiber Production; Subsistence	1. Effective—Potentially, but it would be more effective to monitor subsistence resources, such as fish, freshwater seals, land mammals, and vegetation. 2. Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. PLP has committed to the establishment of a local subsistence advisory committee that could serve as a venue to address concerns regarding subsistence. Measures could be taken to reduce impacts to subsistence resources with more useful results.	Unlikely
Consider use of snow sheds for portions of the road alignment between Williamsport and Pile Bay where avalanches and heavy rain-induced rock fall could occur.	Transportation and Navigation; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Snow and rock containment requirements would be defined and addressed during detailed design.	Possible

EPA-6692-0003210

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Provide a boat launch facility at any bridge crossing a river or creek that is navigable by non-motorized or motorized craft.	Transportation and Navigation	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. There is existing access for motorized craft to the upper Newhalen River and the Gibraltar River. None of the other river crossings are suitable for navigation by craft that would require launching facilities. This would increase project impacts for no defined benefit.	Unlikely
Conduct a coastal and ocean engineering analysis for both Iliamna Lake and the port, and assess environmental conditions to which vessels would be exposed.	Transportation and Navigation	1. Effective—Yes. Information from a coastal engineering study would help ensure the port facilities are properly designed for conditions and project vessels are fit-for-purpose. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. PLP would likely conduct this during final design.	Possible
The Borough expects to work with landowners, the state, and the Applicant to develop a road management agreement that provides rules for how the road will accommodate use by borough residents and businesses.	Transportation and Navigation	1. Effective—Yes. 2. Potential Jurisdiction—~~Lake and Peninsula Borough (~~LPB~~)~~; State of Alaska. 3. Reasonable—Yes.	Probable
Apply principles established by the International Dark Sky organization to minimize visual effects associated with trash light.	Aesthetic Resources	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Project lighting requirements would be defined and addressed during detailed design. PLP would incorporate best practice to address lighting impacts to wildlife and minimize overall lighting requirements, while meeting operational and safety needs.	Possible
Prepare a lighting plan to mitigate light impacts from key observation points.	Aesthetic Resources	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Project lighting requirements would be defined and addressed during detailed design. PLP would incorporate best practice to address lighting impacts to wildlife	Unlikely

EPA-6692-0003211

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		and minimize overall lighting requirements, while meeting operational and safety needs.	
Provide bracing for concentrate containers to secure them in the event of an earthquake	Geohazards and Seismic Conditions; Spill Risk; Health and Safety	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Loaded concentrate containers would be stacked three high in the yards at the port, ferry terminals, and mine site. Stacks on a flat hard surface would be unlikely to collapse, even during earthquakes. In the unlikely event they do collapse, a major container breach is unlikely (see PLP 2018-RFI 045). Any concentrate spill to the yard surface would be immediately recoverable.	Unlikely
Conduct additional paleoseismic studies on the Lake Clark Fault splays using higher-density light detection and ranging (LiDAR) than previously flown; and optimal seasonal timing, followed by geophysical surveys and/or trenching studies if warranted by LiDAR results.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. Would further identify or rule out the location of potential fault splays close to the mine site and their recency of activity. 2. Potential Jurisdiction—State of Alaska (Alaska Department of Natural Resources [ADNR]); Alaska Dam Safety Program [ADSP]). 3. Reasonable—Yes.	Probable
Consider cycloning tailings either before thickening or after thickening, and selective placement of the thickened fines and sands in the bulk TSF, to provide better control over tailings segregation in the bulk TSF.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—~~P~~Could possibly. Could reduce uncertainty in tailings segregation, resulting in better control of the phreatic surface and pore pressure dissipation, and improved embankment centerline raise stability. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable— No. Cycloning ~~would~~ill require two tailings pump and pipe discharges (fines and sands) into the bulk TSF. Cycloning is typically used if sands are needed for other uses, e.g., mine backfill, embankment construction, etc. The fines and sands discharge pipes are totally separate systems. For embankment construction, fines discharge into the TSDF, and sands discharge to the embankment outer face. Cycloning two streams to the bulk TSF ~~would~~ill be very difficult, clumsy, and unsafe because it ~~would~~ill need fines discharge piping located over the continually rising loose sands that workers and equipment cannot safely access.	Unlikely

EPA-6692-0003212

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Conduct gGeotechnical characterization and rate-of-rise tracking of tailings as they build up behind bulk TSF main embankment by surface elevation monitoring, cone penetration tests, drilling and sampling, and laboratory rheology, index, gradation, strength, permeability and consolidation tests, for purposes of monitoring tailings segregation and pore pressures, confirming feasibility of centerline construction, and providing input parameters for raise designs and seepage, stability, and liquefaction analyses under static and seismic conditions.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would provide geotechnical data for centerline raise designs, especially in early years of tailings disposal during highest tailings rates of rise, and would further identify sensitivities in embankment raise design and stability to potential upset conditions (e.g., lack of tailings segregation, tailings too soft and loose near embankment for centerline raise construction, cannot maintain a small surface water pond, high tailings pore-water pressures not dissipating, high tailings ground-water table, etc.). 2. Potential Jurisdiction—State of Alaska (ADNR; ADSP). 3. Reasonable—Yes.	Probable
Stability analyses of the bulk TSF main embankment that study the effects of tailings liquefaction and high embankment pore pressures (PLP 2019-RFI 008g, 008h) should continue to be evaluated as design progresses and future test data are available (e.g., tailings testing); and should include consideration of the following: liquefaction to total depth of tailings, liquefaction during strong ground motions, deeper slide planes (through centerline portion of embankment) with failures in downstream direction, and higher phreatic surfaces (assuming plugging in rockfill shell) (AECOM 2019n).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further identify sensitivities in embankment design and stability to potential upset conditions (e.g., lack of tailings segregation, high water table, plugging in embankment F/T zone or rockfill). 2. Potential Jurisdiction—State of Alaska (ADNR; ADSP). 3. Reasonable—Yes.	Probable
Perform numerical analyses on the bulk TSF main embankment to study the effects of horizontal seismic forces (parallel to longitudinal axis of	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further address potential seismic risk and possibly lead to developing additional design and construction mitigation.	Possible

EPA-6692-0003213

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
dam) on potential development of transverse cracks.		2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	
Incorporate seasonal conditions (such as active zone annual thaw estimates) into future seepage sensitivity analyses performed during detailed design.	Surface Water Hydrology, Geohazards and Seismic Conditions	1. Effective—Potentially, would minimize risk of under- or overestimating water volume needing to be managed. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Possible
The emergency action plan for mine site embankments (required under ADSP) should include procedures for dealing with water levels that approach or exceed maximum operating levels.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further address potential seismic risk and possibly lead to developing additional design and construction mitigation. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Possible
Perform additional site-specific tsunami runup analysis at Amakdedori port that takes into account a combination of high tides, storm surge, waves, subsidence (seismic or fill settlement), and sea level rise.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. Site-specific analyses committed to by PLP would already incorporate most of these factors. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Sea level rise expected to be small compared to combination of other factors.	Possible
Conduct additional modeling of the potential for tsunamis in Iliamna Lake from landslide or submerged seismically induced sources prior to final design of shore-based structures (Higman and Riordan 2019).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially.	Possible
Perform subsurface geotechnical investigation at the port site (to industry-standard depth) to inform the additional stability analyses prior to final design (PLP 2018-RFI 005, 2019-RFI 160).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. Additional investigation and analyses would be industry standard approach.	Possible
Perform structural analyses for the causeway and dock to evaluate displacements and stresses created by vessel lateral loads; gravity, wave, wind, and ice forces; and soil-structure interaction.	Geohazards and Seismic Conditions	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. Additional analyses and design would be industry standard approach.	Possible

EPA-6692-0003214

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Conduct additional design for potential pipeline displacement to minimize damage from potential rupture along unknown faults.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Possibly, if new faults identified as potentially active. 2. Potential Jurisdiction—US Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA). 3. Reasonable—Possibly, if new faults identified as potentially active; special design not typically done if no evidence of recent activity.	Possible
Conduct geotechnical work at horizontal directional drilling (HDD) sites and avoid areas that have high risk of frac-out.	Geohazards and Seismic Conditions, Water Quality	1. Effective—Yes. 2. Potential Jurisdiction—PHMSA; State of Alaska. 3. Reasonable—Yes, additional investigation and HDD plan would be industry-standard approach.	Probable
Conduct further evaluation to protect the closest private well to the HDD route at Anchor Point (Figure 3.17-16), designated well 53874 by ADNR (2016): - Contact owner to confirm status, use, and pumping rate at the well; - Survey location of well compared to HDD final design route; - Consider moving HDD route further south, and/or adjusting depth to provide additional distance or stratigraphic separation from private well aquifer; - Designate a surface buffer around wellhead during construction; - Monitor well flow and quality during all construction activities in the area; and	Groundwater Hydrology, Water Quality	1. Effective—Yes. 2. Potential Jurisdiction—PHMSA; State of Alaska. 3. Reasonable—Yes. Contingency for well replacement may or may not be necessary.	Probable

EPA-6692-0003215

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
- Provide and implement (if necessary) contingency plans for response in the event groundwater flow or quality at the well is altered, up to and including replacement of the private well, water line, and associated activities (engineering, construction, permitting, water testing, temporary water supply, and related costs) needed to acquire new source of comparable water quality and quantity.			
Return the bulk tailings to the open pit at close of mining, eliminating the perpetual open pit lake.	Spill Risk	This was originally suggested as an alternative and assessed in Appendix B as Option TSF-030. Option TSF-030 was eliminated from detailed consideration as an alternative because it is not reasonable. Not reasonable options are also not likely to be required as mitigation.	Unlikely
Install additional secondary containment downstream of the TSFs to capture spilled tailings in the event of a release.	Spill Risk	This was originally suggested as an alternative and assessed in Appendix B as Option TSF-027. Option TSF-027 was eliminated from detailed consideration as an alternative because it would increase the overall impacts as compared to the project. Options that increase impacts are also not likely to be required as mitigation.	Unlikely
Design thicker retaining walls on the TSFs.	Spill Risk	1. Effective—Not necessarily. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. Note that the bulk TSF design includes very substantial buttressing. The thickness of the retaining walls on the TSFs would be determined by engineering design, and the design would maximize the Factor of Safety within practicable limits. Specifying a minimum thickness not driven by engineering design is not likely to occur.	Unlikely
Consider deposition of tailings on ice in the winter (practiced at Red Dog Mine) to mitigate the possibility of	Spill Risk	1. Effective—No. PLP is proposing to operate the bulk TSF with a small pond and large tailings beaches to minimize water	Unlikely

EPA-6692-0003216

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
uneven deposition of tailings around the perimeter of the bulk TSF (because of spigot spacing and segregation of thickened tailings).		against the dam. Uneven deposition of tailings piles would not compromise the integrity of the facility. 2. Jurisdiction—State of Alaska. 3. Reasonable—No. There would be a small pond in an area intended to be low to allow water to accumulate back from the dam. Filling this low area would be counter to management objectives.	
Provide a response and recovery vessel in the event that the ferry breaks down.	Spill Risk	1. Effective—Yes. Would provide additional transportation capacity to address recovery efforts and transportation needs during a potential event. 2. Potential Jurisdiction—potentially State of Alaska. 3. Reasonable—Potentially. The ferry design incorporates multiple redundant features such as independent control rooms, generators, and electric engines, to reduce the potential for loss of power or steering. However, it is likely that additional smaller craft would be available at the ferry facilities.	Possible
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 (e.g., containment booms) adjacent to vulnerable fish-bearing wetlands, streams, and rivers during major construction activities.	Spill Risk	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. PLP would comply with all regulatory requirements and Best Management Practices (BMPs) for the storage and handling of fuel and hazardous substances. The project Spill Prevention, Control, and Countermeasure and Facility Response Plans would outline requirements for storage.	Possible
During fuel or hazardous substance transfer, ensure that a secondary containment is placed under all inlet and outlet points, hose connections, and hose ends.	Spill Risk	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska 3. Reasonable—Yes. PLP would comply with all regulatory requirements and BMPs for the storage and handling of fuel and hazardous substances. The project Spill Prevention, Control, and Countermeasure and Facility Response Plans would outline requirements for fuel transfer.	Probable
Implement operational measures to reduce spill risk and to respond to spill events, such as training personnel in port-specific fuel	Spill Risk	1. Effective—Yes. Implementation of the operational measures would help avoid and minimize the occurrence and the potential adverse effects of spills.	Probable

EPA-6692-0003217

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
offloading and use of an automated tracking system for trucks hauling oil or hazardous materials to facilitate the identification of truck accidents and expedite response activities.		2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. Operational measures for preparedness, prevention, response, and the natural gas pipeline would be implemented as described in response to RFI 126 (RFI 2019-RFI 126).	
If sulfides are found prior to closure, cap the bulk TSF with crushed limestone to minimize acid-generating potential.	Water and Sediment Quality	1. Effective—Yes, subject to field and laboratory testing and analyses to determine the chemical reactions that could occur. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes, despite the fact that the process is designed to recover sulfides from the ore, and based on test work completed, the bulk tailings would be non-acid generating.	Probable
Cover tailings during operations to minimize wind migration by planting native vegetation.	Water and Sediment Quality; Air Quality	1. Effective—No. The tails would be dewatered during operations and would be actively managed (moved around) to maximize beach area (away from the embankments). The vegetation would not be able to establish. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. This is not reasonable during operations because vegetation planted would be quickly inundated by new tailings. A fugitive dust management plan would be implemented and would specify measures to minimize wind erosion. The reclamation and closure plan would outline areas to be revegetated at closure.	Unlikely
In addition to backhauling the pyritic rock waste, the pH of the pit lake should be raised using calcium carbonate or other benign pH buffering material to bring the lake to a pH similar to that found in the surrounding area.	Water and Sediment Quality; Wildlife Values	1. Effective—No. This has not proven effective for large pit lakes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. Would require locating, mining, and transporting limestone to the pit. The costs for transporting would be enormous and the technology has not been proven effective.	Unlikely
Apply dust suppressants on the bulk TSF during and after closure until the tailings can be permanently capped.	Air Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (Alaska Department of Conversation [ADEC]). 3. Reasonable—Yes, the Conceptual FDCP (PLP 2019-RFI 134) includes the use of chemical suppressants to manage dust from the TSF when appropriate. PLP would use chemical dust	Adopted by Applicant

EPA-6692-0003218

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		suppressants on the tailings in compliance with the Conceptual FDCP.	
Implement measures to address dust that collects on the wheels, body, and undercarriage of heavy equipment.	Air Quality; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Equipment would be washed as part of routine maintenance. Additionally, mine operations traffic and access road traffic would be segregated to avoid cross contamination, as outlined in the Conceptual FDCP (PLP 2019-RFI 134).	Adopted by Applicant
Require use of best available control technology (BACT) air pollution controls, such as selective catalytic reduction (SCR) for oxides of nitrogen (NOx) reduction on the flue gases, due to the proximity to federal wildlife preserves.	Air Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Potentially. PLP would be required to obtain the appropriate air permits from the ADEC. All permits would comply with Clean Air Act requirements, and would address requirements for BACT on emissions sources as necessary.	Possible
Use non-toxic palliatives/dust BMPs to reduce fugitive dust.	Air Quality	1. Effective—Yes. 2. Jurisdiction—State of Alaska (ADEC; ADNR). 3. Reasonable—Yes. PLP would use dust palliatives as outlined in the Conceptual FDCP (PLP 2019-RFI 134) in compliance with applicable guidance and regulations (i.e., non-toxic).	Adopted by Applicant
Provide natural gas–generated shore power to vessels while they are in port, rather than having the vessels idle, to reduce NOx at the port.	Air Quality	1. Effective—Yes. 2. Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. PLP has committed to providing shore power for vessels at the Amakdedori port facility (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Use the highest-tiered vehicles available for all mobile sources, to reduce engine emissions.	Air Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. The mine large vehicle fleet would be compliant with Tier 4 standards, or whatever standards are in force, at the time of purchase. It is possible that higher-tiered vehicles would be available but not required by regulation, and it would not be reasonable to require the Applicant to procure vehicles that exceed regulation.	Unlikely

EPA-6692-0003219

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Develop a wildfire mitigation plan to address potential effects of wildland fires on project infrastructure as a result of climate change.	Health and Safety; Climate Change	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (Fire Marshal, Division of Public Safety, Division of Life and Fire Safety). 3. Reasonable—Yes. Wildfire response would be addressed in the project emergency response plans developed prior to construction.	Probable
Consider changing environmental conditions and projections when designing road culverts to avoid velocity barriers from increased winter streamflow. Changes in the timing of life history events should also be considered when formulating timing windows to protect sensitive life stages.	Fish Values; Climate Change	1. Effective—Yes. Recent environmental conditions will be considered. 2. Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. It is reasonable to consider recent streamflow/weather, and road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design.	Probable
If there is no compensatory mitigation identified that would offset project impacts to aquatic resources, include a dredge and fill restriction that would deny use of a defined area in the South Fork Koktuli River, North Fork Koktuli River, and Upper Talarik Creek watersheds if the following mine activities would occur: • The loss of five or more linear miles of streams with documented anadromous fish. • The loss of 19 or more linear miles of streams where anadromous fish are not currently documented, but that are tributaries of documented anadromous streams. • The loss of 1,100 or more contiguous acres with either documented anadromous	Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Potentially. Would reduce impacts to wetlands and fish resources. 2. Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. USACE reviews projects on a case-by-case basis to determine if identifiable adverse impacts to jurisdictional waters would occur from a proposal and if compensatory mitigation would be required to offset those impacts. Additionally, USACE evaluates proposed mitigation for sufficiency, appropriateness and practicability. If the project is determined to require compensatory mitigation and the Applicant cannot provide the compensation, the application would be denied. Additionally, there are no specific linear thresholds or acreages that “must” require compensation.	Unlikely

EPA-6692-0003220

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
streams or tributaries of those streams. • Streamflow alterations of daily flow in 9 or more linear miles of documented anadromous streams.			
Use control measures to reduce the potential for spreading invasive organisms. Hull-fouling organisms (e.g., 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 in that bioregion.	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach outlined in Section 9 of the plan. PLP would comply with USCG indigenous species reduction practices (33 CFR [Code of Federal Regulations] Part 151.2050) which require rinsing of anchors and chains when anchor is retrieved; and the removal and disposal of fouling organisms from vessel hulls, piping, and tanks on a regular basis. PLP would comply with EPA's VGP which sets additional requirements for the minimization of biofouling.	Adopted by Applicant
Inspect boats, trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133). PLP would comply with ADNR's 2014 quarantine that prohibits the transport, trade, or transplant of five invasive aquatic plant species in Alaska.	Probable
Clean, drain, and dry everything that comes into contact with water (e.g., boats, trailers, equipment, clothing, boots, waders) before transporting it to new waters; if practicable, rinse with hot clean water.	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133).	Probable

EPA-6692-0003221

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Drain water from motor, live well, bilge, and transom wells while on land before leaving the vicinity.	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA. 3. Reasonable—Yes. PLP would operate in compliance with the provided Invasive Species Management Plan (PLP 2019-RFI 133). Large commercial vessels would operate in compliance with interim regulations from the USCG (33 CFR Part 151.2050, which sets requirements for the operation of a ballast water management system); EPA-issued VGP, which sets ballast water discharge standards for concentration of viable organisms and microbes; and Alaska Statute (AS) 46.03.750 Ballast Water Discharge. Note: VIDA 2018 extends the 2013 VGP's provisions, leaving them in force and effect until future regulations are enforceable.	Probable
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.	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA; State of Alaska. 3. Reasonable—Yes. PLP would operate in compliance with an Invasive Species Management Plan (PLP 2019-RFI 133). PLP would operate large commercial vessels in compliance with interim regulations from USCG (33 CFR Part 151.2050, which sets requirements for the operation of a ballast water management system); EPA (VGP, which sets ballast water discharge standards for concentration of viable organisms and microbes); and AS 46.03.750, Ballast Water Discharge. Note: VIDA 2018 extends the 2013 VGP's provisions, leaving them in force and effect until future regulations are enforceable.	Probable
If floatplanes are 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; and 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. On takeoff, raise and lower water rudders several times to free weed plant fragments	Wetlands and Other Waters/Aquatic Resources	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP would operate in compliance with an Invasive Species Management Plan (PLP 2019-RFI 133). PLP would operate marine vessels in compliance with USCG guidance and any applicable regulations. PLP would comply with ADNR's 2014 quarantine that prohibits the transport, trade, or transplant of five invasive aquatic plant species in Alaska.	Probable

EPA-6692-0003222

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
while over original body of water or over land. If weeds remain visible on floats or water rudders, return to waterbody and remove plants			
To minimize infestation and spread of spruce bark beetle, timber along rights-of-way for roads and pipelines should be cut in the fall and the logs utilized before the next spring. All slash and logs four inches in diameter and larger should be disposed of by burning, burying, chipping, or peeling. Stumps should be cut as low as possible. Trees next to the right-of-way should be examined for beetle attacks in late summer following cutting. If trees are infested, they should be removed. Care should be taken to avoid scarring trunks with mechanical equipment, severing roots, altering drainage patterns, or severely compacting the soil.	Vegetation	1. Effective – Yes 2. Potential Jurisdiction – USDA US Forest Service Region 10 Forest and Grassland Health 3. Reasonable – Yes. PLP would operate in compliance with an Invasive Species Management Plan (PLP 2019-RFI 133).	Probable
In order to avoid impacts to shoreline habitats and wildlife movements, the port pad limits should be placed back from the upper tidal area to provide an upland habitat fringe along the shoreline, with free spans over this fringe and the shorezone to allow for wildlife and recreational traffic passage along the shore.	Wetlands and Other Waters/Aquatic Resources; Wildlife Values	1. Effective—Yes 2. Potential Jurisdiction—USACE; State of Alaska (ADNR). 3. Reasonable—Yes. The Applicant's Preferred Alternative incorporates this measure. The port pad would be constructed above the MHHW tide line and the caissons placed 60 feet apart to minimize shoreline habitats and allow wildlife movements.	Adopted by Applicant
Establish a 30-mile no hunting or trapping zone around all sides of the McNeil River Sanctuary to minimize impact to the park from hunting bears in and adjacent to the sanctuary.	Wildlife Values	1. Effective—No. The transportation corridor would be in an area north of the sanctuary currently open to hunting. The project would not improve access to the area by the public (roads are proposed to be closed to the general public). 2. Potential Jurisdiction—State of Alaska (Alaska Board of Game, ADF&G).	Unlikely

EPA-6692-0003223

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		3. Reasonable—No. This measure would prohibit current sustainable legal hunting activities outside the McNeil River State Game Sanctuary and Refuge. PLP has committed to a no hunting, fishing, or gathering policy for non-local employees to minimize competition for local resources. The impact analysis gives no indication that the project would result in increased hunting pressure on brown bears. Additionally, the McNeil River State Game Refuge, located between the project and the sanctuary, is closed to brown bear hunting.	
Use bear-proof containers and bear-proof trash receptacles for food and garbage. Food should only be left inside vehicles or other unsecured locations when staff are present and can remove the food source in response to wildlife attracted to the food source.	Wildlife Values; Health and Safety	1. Effective—Yes 2. Potential Jurisdiction— State of Alaska (ADNR) 3. Reasonable—Yes. The Applicant has proposed the use of secure bear-resistant storage for handling food and garbage and has committed to keep food inside buildings and only allow food inside of vehicles for short periods when workers are unable to use dining facilities. Bear-proof vs. bear-resistant may need to be clarified with the Applicant.	Probable
A lessee who encounters an occupied brown bear den not previously identified by ADF&G must report it to the Division of Wildlife Conservation, ADF&G, within 24 hours. Mobile activities shall avoid such discovered occupied dens by one-half mile unless alternative mitigation measures are approved with concurrence from ADF&G. Non-mobile facilities will not be required to relocate. Before commencement of any activities, lessees shall consult with ADF&G to identify locations of brown bear den sites. Additional surveys may be required pre and post construction to determine denning areas and changes in denning use due to project impacts.	Wildlife Values; Health and Safety	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADF&G) 3. Reasonable—Potentially. However, the Applicant does not propose to conduct any mobile activities. All project work would be non-mobile permanent facilities that would last for the life of the project. The recommendation to conduct updated pre-construction bear den surveys is already included as a measure in this table. A post-construction bear den survey would be reasonable and effective at determining potential project-related impacts to bear dens.	Possible

EPA-6692-0003224

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Design and operate facilities to minimize sight and sound impacts in areas of high recreational, and subsistence use and important wildlife habitat. Methods may include providing natural buffers and screening to conceal facilities, sound insulation of facilities, or by using alternative means approved in consultation with ADF&G and the appropriate land manager.	Wildlife Values; Recreation; Subsistence	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes.	Possible
Require mandatory training for mine workers on ethical behavior around brown bear populations (e.g., strict use of bear safe trash cans; strict prohibition of bear feeding and harassing).	Wildlife Values; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—USFWS; State of Alaska (ADF&G). 3. Reasonable—Yes. PLP has committed to the development of a Wildlife Interaction Plan that would establish requirements for the education and training of all project staff and contractors (see Chapter 5, Mitigation, Table 5-2). The plan would address: • Education and training for project personnel and contractors. • Control measures to avoid and minimize human-wildlife interactions. • Deterrence and hazing. • Procedures for reporting wildlife sightings and interactions. • Adaptive management approach.	Adopted by Applicant
Avoid fragmenting large, contiguous tracts of intact habitat, especially if habitat cannot be fully restored after construction.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Co-location of facilities and footprint minimization to reduce all environmental impacts was a primary consideration in the design of the project. Additional avoidance opportunities do not appear to be available.	Unlikely
Co-locate activities into disturbed areas to the maximum extent practicable to reduce disturbance of migratory bird habitat.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 4. Reasonable—No. Collocation of facilities to reduce all environmental impacts was a primary consideration in the design of the proposed project. Additional avoidance opportunities do not appear to be available.	Unlikely

EPA-6692-0003225

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
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).	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. Vegetation clearing activities would follow—to the maximum extent practicable—the USFWS Recommended Time Periods for Avoiding Vegetation Clearing in Alaska. If clearing outside of recommended time periods becomes necessary, PLP could coordinate with the USFWS for guidance on other acceptable methods to prevent disturbance to nesting birds.	Probable
Minimize prolonged human presence near nesting birds during construction and maintenance actions.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. PLP has committed to the development of a Wildlife Interaction Plan that would establish requirements for the education and training of all project staff and contractors (see Chapter 5, Mitigation, Table 5-2). The plan would address: • Education and training for project personnel and contractors. • Control measures to avoid and minimize human-wildlife interactions. • Deterrence and hazing. • Procedures for reporting wildlife sightings and interactions. • Adaptive management approach.	Probable
Instruct all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Fish and Wildlife Service webpage on regulations and policies (https://www.fws.gov/birds/policies-and-regulations.php).	Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to the development of a Wildlife Interaction Plan that would establish requirements for the education and training of all project staff and contractors (see Chapter 5, Mitigation, Table 5-2). The plan would address: • Education and training for project personnel and contractors. • Control measures to avoid and minimize human-wildlife interactions. • Deterrence and hazing. • Procedures for reporting wildlife sightings and interactions.	Adopted by Applicant

EPA-6692-0003226

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		• Adaptive management approach.	
To reduce bird collisions, place transmission lines associated with the development underground, where possible. In particular, powerlines should be installed underground in areas of high avian use such as waterfowl around ponded areas, and coastal shorelines. 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 powerlines are sited in migratory bird habitat, attach bird flight diverters (i.e., flappers) or related deterrent devices that are durable and visible to reduce collision risk.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. PLP would follow BMPs with respect to the design and placement of powerlines to avoid impacts to birds. Burial of powerlines is not practicable or safe in many instances.	Possible
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.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. Project lighting requirements will be defined and addressed during detailed design. PLP would incorporate best practices to address lighting impacts to wildlife and minimize overall lighting requirements, while meeting operational and safety needs.	Possible

EPA-6692-0003227

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
If material sites are established by excavating the sides of hills, a natural contour should be established rather than a high wall on one or more sides. If these sites are more like dug pits that are expected to fill with water, they should be contoured to form emergent wetlands along the edges, rather than deep steep-sided pits.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USACE and landowners. 3. Reasonable—Potentially. Most material sites can be excavated or reclaimed to avoid steep side slopes and rectangular shapes if desired by the landowner.	Possible
Work with the local residents to manage access and the potential increased harvest of fish and wildlife due to the additional access provided by the roads and infrastructure development associated with the project.	Wildlife Values	1. Effective—No. 2. Potential Jurisdiction—State of Alaska and landowners. 3. Reasonable—No. The Applicant would have no role in managing use of the roads by local residents for hunting and fishing (they have committed to prohibiting employees from hunting and fishing while working).	Unlikely
Reduce the frequency of truck traffic on the port access road using convoys or closure periods to reduce impacts to brown bears crossing the road.	Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Closure periods when bears are most likely to be traveling may be reasonable. The locations of closures and timing may change in synchrony with seasonally abundant resources along the transportation corridor.	Possible
Update bear denning surveys prior to construction.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. Additional bear den surveys may indicate areas that should be avoided, or seasonal work restrictions.	Probable
Recommendations for how to avoid disturbing raptor nests should be followed, and species-specific buffer zones and temporal restrictions should be established based on empirical research (e.g., Richardson and Miller 1997).	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. Implementation of avoidance buffers during construction would reduce potential impacts to nesting eagles protected by the Bald and Golden Eagle Protection Act and other migratory bird protected by the Migratory Bird Treaty Act.	Possible
Complete a detailed Bear Interaction	Wildlife Values	1. Effective—Yes	Probable

EPA-6692-0003228

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Plan designed to minimize conflicts between bears and humans that would be incorporated into the Wildlife Interaction Plan. The plan should be coordinated with ADF&G. At a minimum the plan should include measures to: * minimize attraction of bears to facility sites; * organize layout of buildings and work areas to minimize interactions between humans and bears; * warn personnel of bears near or on facilities and the proper actions to take; * if authorized, deter bears from facility sites; * provide contingencies in the event bears do not leave the site; * provide for the proper storage and disposal of food, garbage or other industrial materials that may be attractants to bears; * provide for the proper storage and disposal of materials that may be toxic to bears; * provide a systematic record of bears on the site and in the immediate area; and * additional measures as developed in consultation with ADF&G.		2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. Given the area has a high density of brown bears, specific attention to bear-human interactions within the Wildlife Interaction Plan is reasonable and prudent.	

EPA-6692-0003229

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Complete brown bear, moose, and caribou habitat use, movement, and bear denning surveys in order to determine important habitat use areas to be avoided or to implement design features ~~at: complete brown bear, moose, and caribou habitat use, movement, and bear denning surveys in order to determine important habitat use areas to be avoided or to implement design features at: complete brown bear, moose, and caribou habitat use, movement, and bear denning surveys in order to determine important habitat use areas to be avoided or to implement design features at:~~	Wildlife Values	1. Effective—~~Yes~~ 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Potentially. Additional surveys may help tweak minor project components but would occur too late in the permitting process to permit major project adjustments.	Possible~~Unlikely~~
The following measures are detailed in the NMFS Biological Assessment (Appendix H) and summarized herein. For measures that are already listed elsewhere (such as spill response measures in Table 5-2), they are not repeated below. These measures are preliminary and not considered final until issuance of a biological opinion by the NMFS. • The project would employ Protected Species Observers (PSOs) to monitor shutdown exclusion zones during Project activities that produce underwater noise levels above harassment or injury take thresholds. • To mitigate for construction noise impacts to cetaceans	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—~~USFWS;~~ NMFS. 3. Reasonable—Yes. Although these measures are in draft form, they may be required in the final version~~s~~ of the biological assessment~~s~~ and included in the biological opinion~~s~~ issued by ~~USFWS and~~the NMFS. Additional reasonable and prudent measures may be included in their biological opinion~~s~~.	Probable

EPA-6692-0003230

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
and pinnipeds during construction, the Applicant would develop and implement a Marine Mammal Monitoring and Mitigation Plan (4MP). Details of the 4MP include the use of PSOs, ramp-up procedures, monitoring of zones, and others. • Blasting in Iliamna Bay above the high tide line for construction of the Diamond Point port access road would be timed to coincide when low tides are at or near minimum elevation to avoid in-water transfer of sound. • Vessel speeds would be limited to 10 knots within lower Cook Inlets north of Augustine Island to mitigate potential vessel strike with marine mammals. • The mooring systems and components of the anchor cable would be annually inspected each fall after the close of the Cook Inlet salmon setnet fishery to ensure they are in good working order. Any debris caught on the cables would be removed and properly disposed of at that time.~~Avoidance and minimization measures from~~			

EPA-6692-0003231

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
~~the draft USFWS and National Marine Fisheries Service (NMFS) BAs (Appendices G and H, respectively) are briefly summarized below. The measures in the final USFWS and NMFS BAs will supersede any of these measures.~~ ~~1. Employ Protected Species Observers to monitor shutdown safety zones during activities that produce excessive underwater noise.~~ ~~Reduce vessels speeds in Kamishak Bay to less than 10 knots.~~			
The following measures are detailed in the USFWS Biological Assessment (Appendix G) and summarized herein. For measures that are already listed elsewhere (such as spill response measures in Table 5-2), they are not repeated below. These measures are preliminary and not considered final until issuance of a biological opinion by the USFWS. • The project would employ Protected Species Observer(s) (PSOs) to monitor shutdown exclusion zones during Project activities that produce underwater noise levels above harassment or injury	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. Although these measures are in draft form, they may be required in the final version of the biological assessment and included in the biological opinion issued by the USFWS. Additional reasonable and prudent measures may be included in their biological opinion.	Probable

EPA-6692-0003232

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
take thresholds for northern sea otter. • To mitigate for construction noise impacts to sea otters, the Applicant would develop and implement a Marine Mammal Monitoring and Mitigation Plan (4MP). Details of the plan include the use of PSOs, ramp-up procedures, monitoring of 984-foot exclusion zones around fill placement activities, and others. • Vessel speeds would be limited to 10 knots for all Project construction vessels operating inside the northern sea otter critical habitat. • During operations, supply barges, fuel barges, and concentrate bulk vessels would travel at their normal cruising speeds when entering lower Cook Inlet but would reduce speeds to less than 10 knots when entering sea otter foraging habitat (delimited by the 66-foot depth contour). All lightering barges would operate at speeds less than 10 knots. • Guide cables will not be used to secure the communications tower to minimize avian collision risk.			

EPA-6692-0003233

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
• Develop a lighting plan to reduce construction and operation lights that might attract eiders or implement lighting that might assist eiders in early detection of structures, including: • PLP would follow USFWS best practices for communication tower lighting by avoiding or minimizing the use of lights or utilizing flashing light options that comply with FAA requirements. • Any light stanchions or equipment located on the causeway/wharf during the first summer of construction would be lowered or removed before winter if not in use, thereby reducing or eliminating eider collision risk. • Utilize lighting options for the causeway and jetty that minimize bird attraction (such as orienting the lighting downward) while still providing enough light for safe operational activities. • Mitigation lighting for anchored bulk carriers would also be examined. • Measures to reduce accidental spills include use of marine radar to avoid			

EPA-6692-0003234

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
other vessels and accurately approach the wharf. • The concentrate conveyor would be fully enclosed within a tubular structure to contain dust and shed snow. • The barge loader would be fitted with a mechanical dust collection system and each barge would have a cover system to prevent fugitive dust and protect the concentrate from precipitation. During lightering operations, the barge's internal system would retrieve and convey concentrate to the bulk carrier via a self-discharging boom conveyor. The boom would be fully enclosed and equipped with a telescoping spout and would have mechanical dust collection to prevent spillage of fugitive dust.			
Implement measures detailed in the Biological Opinion on Lease Sale 244 (Consultation 2016-F-0226)(USFWS 2017). Some of these applicable measures, briefly summarized, include: 1. Protected species monitoring during project operations. ~~Protected species observers (~~PSOs) will be station aboard project vessels and will watch for	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. Although these measures are specific to a consultation between the Bureau of Ocean Energy Management and USFWS, similar measures may be required by USFWS for the Pebble Project consultation.	Possible

EPA-6692-0003235

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
and identify listed species and initiate mitigation measures. 2. Operators of vessels should maintain a distance of 328 feet from sea otters. 3. Vessels should reduce speed when near sea otters or during periods of reduced visibility. 4. Vessels must not operate in a way to separate members of a group of sea otters. 5. All aircraft must conduct their activities at the maximum distance possible from sea otters, with fixed-wing aircraft operating at altitudes no lower than 300 feet when near sea otters. Helicopters may not hover or circle over marine mammals or flocks of birds, and must not operate below 1,000 feet when near sea otters. 6. Lighting protocols will be implemented that minimize the outward radiation of light. High-intensity work lights on vessels will be minimized, especially beyond the 66-foot bathymetric contour. 7. Report avian and sea otter encounters/collisions with vessels.			

EPA-6692-0003236

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
To avoid constricting the natural channel and to allow connectivity of the floodplain, at minimum, stream crossings should meet the USFWS and US Forest Service (USFS) guidelines, which can be found at: https://www.akfishhabitat.org/ and https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054564.pdf	Fish Values; Water and Sediment Quality; Surface Hydrology	1. Effective—Yes~~Potentially, but not supported by the effects analysis~~. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially~~No~~. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria but would require modern design for state permitting of culverts and bridges.~~This measure is beyond what the ADF&G requires for permitting and approval of culverts. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design~~.	Possible~~Unlikely~~
Stream crossing designs should 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% of the channel width measured at ordinary high water mark.	Fish Values	1. Effective—Yes~~Potentially, but not supported by the effects analysis~~. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially~~No~~. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria but would require modern design for state permitting of culverts and bridges~~This measure is beyond what ADF&G requires for permitting and approval of culverts. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design~~.	Possible~~Unlikely~~
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.	Fish Values	1. Effective—Potentially~~, but not supported by the effects analysis~~. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially~~No~~. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria but would require modern design for state permitting of culverts and bridges.~~This measure is beyond what ADF&G requires for permitting and approval of culverts. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design~~.	Possible~~Unlikely~~
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	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP is not proposing to modify streams outside of the project impact footprint. Impacts to streams inside the footprint would be in accordance with project permits.	Probable

EPA-6692-0003237

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
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.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. PLP is not proposing to modify streams outside of the project impact footprint. Impacts to streams inside the footprint would be in accordance with project permits and would not be avoidable.	Unlikely
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.	Fish Values; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. Minimizing impacts to waterbodies was a primary consideration in the design of the project, and has been implemented to the extent feasible.	Probable
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 (e.g., lakes, streams, wetlands, coastal waters, temporary diversion channels).	Fish Values; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—PLP would comply with, and has committed to the development of, a Storm Water Pollution Prevention Plan and an Erosion and Sedimentation Control Plan that would address these issues (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Streambank restoration should incorporate bioengineering techniques (e.g., root wads, bundled water-tolerant willows and other measures outlined in the Streambank Revegetation and Protection: A Guide for Alaska [ADF&G 2005]), where possible, to maintain natural velocities, prevent bank erosion, and	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP has prepared a Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123). The plan addresses streambank restoration guidelines that would be considered for waterbody crossings.	Probable

EPA-6692-0003238

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
promote healthy riparian system functions that are important to aquatic species.			
Where possible, avoid disturbance in areas of eelgrass and kelp growth, which provide rearing and refugia habitat for a wide variety of species.	Fish Values	1. Effective—Not applicable. No eelgrass or kelp has been identified within the port footprint. 2. Potential Jurisdiction—USACE. 3. Reasonable—No additional avoidance is reasonable, given that no eelgrass or kelp has been identified within the port footprint.	Unlikely
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.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. The vehicles that would be using the Amakdedori port and Iliamna Lake facilities are too heavy to operate on light-penetrating materials.	Unlikely
Limit in-water construction windows for bridge construction to time periods outside of spawning.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—USACE; State of Alaska. 3. Reasonable—Yes, for work in waters that support spawning.	Probable
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).	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—USACE. 3. Reasonable—Yes. Design-for-closure was a key concept in the development of the project as outlined in the Project Description. The Applicant has documented avoidance and minimization of Waters of the US (WOUS) in Tab 23 of the Department of the Army permit application.	Adopted by Applicant
Plan to sequence construction activities so 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	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. AS 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 Alaska Administrative Code [AAC]	Probable

EPA-6692-0003239

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
and topsoil layers for stockpiling for reclamation.		97.300 – 97.350). At the end of operations, mine facilities would be closed and reclaimed in accordance with permit regulations and following guidance set forth in the draft Reclamation and Closure Plan (RCP), which makes recommendations for the salvage and storage of growth media.	
Salvage the maximum amount of organic material and topsoil (hereafter, 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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. Alaska Statute (AS) 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 AAC 97.300 – 97.350). At the end of operations, mine facilities would be closed and reclaimed in accordance with permit regulations and following guidance set forth in the draft RCP, which makes recommendations for the salvage and storage of growth medium.	Probable
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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. AS 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 AAC 97.300 – 97.350). The draft RCP makes recommendations for reclamation during construction, concurrent with mining and for areas requiring interim stabilization, all of which provide opportunity for the direct use of salvaged materials without storage.	Probable
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.	Vegetation	1. Effective—Potentially. Redistribution of stored topsoil is not known to maintain plant propagule viability. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Partially. In accordance with PLP's Restoration Plan, stored topsoil may be redistributed across vegetation test plots and/or interim restored sites to determine its revegetation potential.	Possible
When redistributing topsoil, spread it to a uniform and stable thickness and prevent it from becoming compacted	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR).	Probable

EPA-6692-0003240

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
or eroded by wind and water until vegetation is established.		3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seed bed preparation, growth medium thickness, and the use of soil erosion and sediment migration control measures such as silt fences, straw wattles, rolled erosion control products, and water bars.	
If topsoil would not be spread for use in interim reclamation and would not be used in 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.	Vegetation	1. Effective—Partially. If salvaged material is stored with organic matter on top, then germination from the native seedbed, without seed amendments, is likely. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Potentially. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seed bed preparation, seed and seeding.	Possible
Interim seeding, using native plant seed, may be necessary to keep topsoil viable, control erosion, reduce surface runoff, and maintain other habitat characteristics.	Vegetation	1. Effective—Yes. For the interim stabilization of disturbed sites. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seed bed preparation, seed and seeding, as well as erosion control.	Probable
Slopes should be contoured to blend with surrounding topography; consider using water bars or contour furrowing on steeper slopes.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for slope contouring and benching.	Probable
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).	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seedbed preparation, including ripping and scarification, both of which would serve to increase habitat complexity.	Probable

EPA-6692-0003241

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
During final reclamation, after final grading and before replacing topsoil and other segregated materials, the regraded land should be ripped to promote root penetration.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's draft RCP makes recommendations for seedbed preparation, including scarification, to promote revegetation success.	Probable
Create surface roughness to help control surface water runoff and reduce sedimentation.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seedbed preparation, including ripping, scarifying, and tilling.	Probable
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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each recommend the use of certified, weed-free seed (11 AAC 34.075) mixtures as suggested in the Alaska revegetation and erosion control guides (Czapla and Wright 2010; Czapla and Wright 2012).	Probable
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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each recommend use of soil erosion and sediment migration control measures such as silt fences, straw wattles, rolled erosion control products, and water bars.	Probable
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	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR; ADEC); EPA. 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each recommend use of soil erosion and sediment migration control	Probable

EPA-6692-0003242

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
such as jute, sisal, or coir fiber. Plastic degradable netting is not recommended for use in erosion control for any aspect of the 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 that are blown or washed into waterways, creating a toxic ingestion hazard for aquatic wildlife for many years.		measures such as silt fences, straw wattles, rolled erosion control products, and water bars. PLP would also be required to prepare a Stormwater Pollution Prevention Plan for submission to ADEC.	
Identify locations of known invasive plant infestations. Plan activities accordingly to avoid infestations.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133) which would be regularly revised using an adaptive management approach as outlined in Section 9 of the plan.	Probable
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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133).	Probable
Revegetate bare soils with native plants as soon as feasible to minimize the possible establishment of invasive plant species.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) is specific to temporary habitat loss associated with project construction, and outlines plans for revegetation using native plant communities.	Adopted by Applicant

EPA-6692-0003243

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
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.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach as outlined in Section 9 of the plan.	Possible
Avoid cleaning equipment in or near waterways or wetlands, which are particularly sensitive to invasion and could result in changes to aquatic organism habitat/function.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133).	Possible
If working in infested areas, time disturbance activities so that they occur prior to the plants setting seed. Contact the University of Alaska Fairbanks Cooperative Extension Service or the Department of Agriculture (http://plants.alaska.gov) for timing information if you are unsure.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133).	Possible
Coordinate with local village or other groups in the project area to identify locations and opportunities to collaborate efforts to minimize invasive infestations.	Vegetation	1. Effective—Potentially. Existing infestations of invasive plants are known; collaboration to minimize future introductions could be effective. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach as outlined in Section 9 of the plan.	Possible
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. Arranging a supply of seeds and cuttings in advance would allow quick access to materials after a spill requiring excavation and restoration.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) was developed to restore temporarily impacted natural habitats recommends stockpiling of vegetation and topsoil, as well as the use of certified seed (11 AAC 34.075) mixtures as suggested in the Alaska revegetation and erosion control guides (Czapla and Wright 2010; Czapla and Wright 2012).	Possible

EPA-6692-0003244

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Ship concentrate in containers instead of bulk carriers to eliminate the potential for fugitive dust when the containers are emptied into the ship's hold.	Water and Sediment Quality	1. Effective—Yes. Would reduce the potential for fugitive dust during transfer to bulk carriers. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. PLP has proposed a system that keeps the concentrate in containers with a locked lid until the container is lowered into the ship's hold (PLP 2018- RFI 045 and PLP 2019-RFI 009c) to reduce fugitive dust. Shipping the concentrate in containers would increase the cost of shipping.	Unlikely
Ship concentrate in containers instead of bulk carriers to mitigate for potential loss from the ship if under adverse conditions or an accident. Recommend considering whether leaving the concentrate within the cargo containers would be a better mitigation measure against potential for loss of concentrate to the marine environment in the event of an accident.	Water and Sediment Quality	1. Effective—No. Containers have been lost from container ships. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Shipping the concentrate in containers would increase the cost of shipping, and containers have been lost in cases of heavy seas and vessel collision.	Unlikely
Redundancy in BMPs: The Water Quality Section includes a statement regarding potential for overwhelming BMPs "resulting in an influx of fine sediment and increased turbidity into gravel-dominated streambeds" (pg. 4.18-19). Recommend redundancy in BMPs in areas near these streams, and that settling basins/ponds/ditches on the mine site be sized to consider extreme events to mitigate against release off-site.	Water and Sediment Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially.	Possible
Establish appropriate agreements with GCI that are consistent with standard agreements used in the utility industry to address line crossings and other potential conflicts and comply with the land use	Socioeconomics	1. Effective—Potentially but as stated in the suggested measure, it is standard practice for project proponents to address line crossings and other conflicts with utility owners. 2. Potential Jurisdiction—No clear agency jurisdiction.	Unlikely

EPA-6692-0003245

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
authorizations and instruments governing GCI's facilities and third-party uses, including obtaining prior consent from GCI and/or the relevant landowners where required, and adhering to non-interference obligations.		3. Reasonable—Potentially. It would be reasonable for PLP to enter into appropriate agreements with utilities in the project area but it may not be reasonable for a federal agency to include such a condition in permits.	
~~Section 4.18, Water Quality, and AECOM 2018l noted concern that salt and selenium could build up over time, which could lead to increased total dissolved solids and selenium concentrations that could not successfully be treated. It was concluded that further investigation and mitigation measures or improved management processes are recommended to ensure that WTP performance will meet treatment goals. We recommend that additional mitigation or treatment system adjustments be identified in Table M-1 with enough detail and added analysis to demonstrate that it would improve WTP performance to meet water treatment goals.~~	~~Water and Sediment Quality~~	~~1. Effective—Yes.~~ ~~2. Potential Jurisdiction—State of Alaska.~~ ~~3. Reasonable—Yes. Additional detail and added analysis was provided by PLP in response to RFI 021e (PLP 2019 RFI 021e). Further refinement of the WTP design/process would occur in later design and permitting phases if the project advances.~~	~~Probable~~
Complete further site characterization, hydraulic testing, and model simulations to support future stages of design in the vicinity of the ~~bulk~~ TSFs ~~and main WMP~~ to address potential seepage ~~from the TSFs and main WMP.~~s	~~Groundwater Hydrology,~~ Water and Sediment Quality	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADNR, ADEC) 3. Reasonable—Yes	~~Probable~~
Conduct the following evaluations of WTP processes during design engineering and permitting:	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Recommendations are considered state-of-practice for the industry.	Probable

EPA-6692-0003246

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
• Fully assess proposed treatment solutions regarding operational conditions in terms of pH and ORP to produce stable precipitation solids that will not be remobilized. • Further evaluate conditions within the pyritic TSF and the potential for remobilization of salt mass to validate treatment assumptions. Consider development of a consolidated mass balance model for the full mine water circuit by project phase to predict where key constituents exit facilities, the potential for accumulation of constituents within facilities (such as salts), and the potential for remobilization of those constituents in subsequent phases. • Further evaluate the validity and reasonableness of proposed removal efficiencies for various constituents to fully assess proposed treatment solutions; in particular, consider the use of biological treatment technologies for selenium removal.			
Adopt the following adaptive management steps with regard to the WTPs: • If proposed treatment strategies for managing TDS treatment and salt buildup in the pyritic TSF prove to be ineffective, modify	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Recommendations are considered state-of-practice for the industry.	Probable

EPA-6692-0003247

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
the WTPs with additional unit processes, such as further RO trains and/or salt removal techniques such as thermal evaporation. • Further evaluate whether engineering and construction for such significant changes to the treatment processes can be completed within the three-year period of available mine site water storage capacity (PLP 2019-RFI 021h).			
Pumping tailings supernatant to the main WMP could be an additional mitigation measure to enhance stability, by further removing water from a lined TSF.	Safety	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Proposed by the Applicant (included here because it was suggested specifically as a mitigation measure).
Raise the Alaska mine production royalty fee (Alaska Statute 38.05.212) from the current 3% to a level (e.g., 20%) sufficient to establish a permanent fund similar to the Alaska oil–based permanent fund. This fund could then be used to fund the foreseeable pit lake and water quality maintenance into perpetuity, as well as help offset economic losses related to a loss or reduction of aquatic habitat production potential.	Socioeconomics	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. PLP is required to establish financial assurance through an existing process that does not require raising the royalty fund. This mitigation measure would not have adequate funding for reclamation if the Applicant were to cease operations early in the project, whereas the existing process requires bonding/financial assurance at all project stages.	Unlikely
Collect further hydrogeologic data at future stages of project design to characterize the hydraulic properties of the bedrock in the vicinity of the interpreted fault mapped along the western margin of the bulk TSF to	Groundwater; Water Quality	1. Effective—Yes. Would help maintain hydraulic containment and protect groundwater quality beneath the bulk TSFtreatment. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. This would be a preventative measure, which is far easier than remediating contaminatedive	Probable

EPA-6692-0003248

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
allow for design of appropriate mitigation (e.g., grouting, partial liner placed over the fault trace, seepage collection wells), should this be necessary.		groundwater should it occur as a result of leakage through a fault.	
Survey the port footprint and immediately adjacent road corridor with ground-penetrating radar to identify potential areas for cultural resources and historic properties site investigations. Use smaller transects than 15-meter distances, and as appropriate, other on-the- ground investigation to find or clear the area for graves or cultural sites.	Cultural Resources	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—No. The port footprint has been surveyed, and results documented. Any inadvertent discoveries during construction would follow the process as laid out in the Programmatic Agreement.	Possible
Designate all communities within the Borough as pick-up points where employees are transported free of charge to the project. In addition, the Borough would expect the company to designate areas outside the Borough—such as Kenai or Anchorage—as pick-up points so that employees do not have an incentive to move to the Borough to avoid transportation costs.	Needs and Welfare of the People—Socioeconomics	1. Effective—Yes. 2. Potential Jurisdiction—LPB; State of Alaska. 3. Reasonable—Yes~~Partially~~. ~~Designating all communities in the LPB would not be practicable; however, i~~it is likely that PLP would transport workers to the mine site at no cost to the employee.	Probable~~Possible~~
MONITORING AND ADAPTIVE MANAGEMENT			
Baseline water quality and biological surveys should be conducted before the project begins, at a sufficient spatial scale to encompass the affected area and the potentially impacted area. It was recommended that these baseline levels be established in multiple streams/reaches immediately adjacent to the mine site; in several	Water Quality; Fish Values; Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has already committed to the development of an Aquatic Resources Monitoring Plan. These plans would address requirements for monitoring at project facilities.	Possible

EPA-6692-0003249

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
locations and at several distances downstream of the mine site in both the Nushagak and Kvichak watersheds; at Iliamna Lake, both at the ferry port locations and at the outflow from Upper Talarik Creek; and along a sample of the streams that would be crossed by the transportation corridor.			
Monitor the ferry crossing for evidence of smolt/fish impacts. If birds are observed feeding on disoriented fish, require the ferry to use deterrents such as water spray or streamers to reduce bird predation.	Fish Values; Wildlife Values	1. Effective—Yes. Bird deterrents are used to reduce bird activity around long-line fishing gear. 2. Potential Jurisdiction—State of Alaska; LPB~~No clear agency jurisdiction~~. 3. Reasonable—Yes. It appears reasonable to monitor the ferry crossing, and if an impact is observed, evaluate mitigation measures.	Probable~~Possible~~
To detect changes to water quality and its effects to fish and wildlife, water quality (at the same locations as baseline monitoring) should continue to be monitored on a regular basis until the mine reclamation is complete (recommendations for both seasonal and annual sampling were received). An annual report detailing the results of this sampling should be provided to the USACE and resource agencies.	Water Quality; Fish Values; Wildlife Values	1. Effective—Yes. Water quality monitoring is effective. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Partially. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has already committed to the development of an Aquatic Resources Monitoring Plan. These plans will address requirements for monitoring at project facilities. An annual report would not be provided to USACE because USACE does not regulate water quality at mines (the State of Alaska is the regulating agency).	Possible
Reclamation plans should 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	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123), draft Reclamation and Closure Plan (PLP 2019-RFI 115), and Invasive Species Monitoring Plan (PLP 2019-RFI 133). Collectively, these plans make recommendations for monitoring and performance criteria for revegetation,	Probable

EPA-6692-0003250

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
with percent of desirable species and variety of desirable species, percent not covered (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 (e.g., forage fish, juvenile, nursery, piscivorous). • Measurement of erosion control success (evidence of rilling, gullies, rutting, slumping, etc.). • Evidence of wildlife (e.g., tracks, scat, nests). • Photo documentation.		restoration of wetlands and waterbodies, and the monitoring and control of invasive species, as well as annual reporting.	
Conduct reclamation monitoring for all phases of development during construction, operations, and final reclamation.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which sets forth monitoring requirements for restoration and performance criteria for revegetation.	Probable
Reclamation monitoring plans should include nearby reference sites to provide ongoing information through data collection and photographic stations. 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).	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which sets forth performance criteria for revegetation, specifically in reference to adjacent, ecologically similar areas not disturbed by project construction activities.	Probable

EPA-6692-0003251

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
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. 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.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which makes recommendations for annual monitoring and sets forth performance criteria for revegetation, specifically in reference to adjacent, ecologically similar areas not disturbed by project construction activities. Procedures for the monitoring and control of invasive species are described in PLP's Invasive Species Monitoring Plan (PLP 2019-RFI 133).	Probable
Implement an ongoing environmental studies program to help inform the public that the project is being done safely. Make studies available to the public.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has already developed a Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123), a draft Reclamation and Closure Plan (PLP 2019-RFI 115), an Invasive Species Monitoring Plan (PLP 2019-RFI 133), and has committed to the development of an Aquatic Resources Monitoring Plan. The results of ongoing monitoring and agency inspection reports would be public documents.	Probable
Monitor for climate change trends and engage with local communities on discussions of ecological and biological communities, plant communities, animal species and communities, and indigenous economies.	Wildlife Values; Fish Values; Subsistence	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Community engagement on ecological and biological communities, animal species and communities, and indigenous economies may provide information on changes to these communities due to climate change that may help inform adaptive management needs for wildlife, fish, and subsistence resources.	Possible

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Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Monitor culverts along project roads for fish passage, and develop a maintenance plan for culverts that may become blocked by debris or ice or hydrological changes.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. This is a likely permit stipulation.	Probable
Conduct an annual audit (performed by a third party) for compliance with project permits, and to ensure adequate oversight of the mine by state regulators.	General	1. Effective—Yes. 2. Jurisdiction/Enforcement—No specific regulatory requirement. 3. Reasonable—Yes. PLP has committed to periodic third-party audits of the Pebble Mine facility (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Establish an oversight board to represent all those who are economically active in the 'traditional' fishing and wildlife watching community(ies). The board should review scientific data representing the status and trends of fish and wildlife populations through changes caused by global climate change, as well as mining (suggested at intervals no greater than 6 months).	Recreation, Fish Values, Wildlife	1. Effective—No. Other entities already review trends of fish and wildlife. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. PLP has proposed to establish a local advisory committee to facilitate communications and address concerns during construction and operations. The ADF&G is responsible for managing most fish and wildlife populations, with additional research conducted by others, including the University of Washington.	Unlikely
Factor in climate change into long-term monitoring plans. Climate change and the predicted increases in water surplus for the region could result in potential changes in streamflow magnitude and seasonality, requiring adaptation to potentially new water management regimes for the water processing facilities.	Surface Water Hydrology; Groundwater Hydrology	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. Analysis in Section 4.16, Surface Water Hydrology, incorporates climate variability into the mine water management plan model. Acknowledgement of the need to accommodate for change in streamflow magnitude and seasonality resulting in a potentially new water management regime could be incorporated into long-term monitoring plans.	Probable
Monitor subsistence resources for contaminants and publicize results.	Subsistence; Health & Safety	1. Effective—Yes. Communication with residents about the levels of contamination in subsistence foods could help reduce impacts to human health, as well as reduce avoidance if there is no contamination. 2. Potential Jurisdiction—State of Alaska.	Possible

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Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
		3. Reasonable—Potentially. It may be possible for PLP to coordinate with state agencies to conduct routine monitoring, but may not be appropriate to include in permit stipulations.	
Monitor differences in pit lake water quality with depth as it stratifies, and adjust pit lake pumping depth to optimize WTP performance.	Water and Sediment Quality	1. Effective—Probably. May avoid unnecessary water treatment. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Some constituents may have lower water quality near lake surface due to pit wall runoff.	Possible
Conduct additional monitoring ~~of regarding the~~ actual groundwater conditions (values of hydraulic head) at depth below the pit or near the pit lake to confirm or revise model findings and water pumping plans as needed, and to confirm that hydraulic containment would be maintained.	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. Hydraulic containment should be demonstrated with adequate data in addition to modeling. 2. Potential Jurisdiction—State of Alaska (ADNR, ADEC) 3. Reasonable—Yes. Deep drilling outside of pit would be expensive; less so if completed as in-pit wells as pit advances.	Probable
Update watershed, water balance, and groundwater flow model during operations, closure, and post-closure at least every 5 years based on updated water use, streamflow, precipitation, groundwater, and pit lake level monitoring data until pit lake conditions reach annualized steady-state conditions, including consideration of climate change.	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. Updated model based on ongoing monitoring data allows for consideration of changing or newly discovered conditions and provides better predictions for future water management. 2. Potential Jurisdiction—State of Alaska (ADNR) 3. Reasonable—Yes. May be part of closure permitting.	Probable
In the Monitoring and Adaptive Management Plan (particularly Sections 3.1 and 3.4) identify how the monitoring could be used to assess impacts from the authorized discharges or from an exceedance of a discharge criteria.		4. Effective—TBD 5. Potential Jurisdiction—TBD 6. Reasonable—TBD	TBD

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