APPENDIX B—ALTERNATIVES DEVELOPMENT PROCESS

B1.0 PURPOSE

This appendix supplements the alternatives discussion in Chapter 2, Alternatives. It further explains the alternatives development process for the Pebble Project Environmental Impact Statement (EIS); explains each step of the process; and provides the option screening criteria. This appendix provides a detailed explanation of the screening criteria applied, and an explanation for why each of the many project options that were evaluated were either included as a component of one of the action alternatives evaluated in detail, or eliminated from detailed analysis.

B1.1 OVERVIEW OF THE ALTERNATIVES DEVELOPMENT PROCESS

Scoping yielded comments that provided input to the alternatives development process. The EIS team used a structured alternatives development process to recognize the project's large geographic footprint, the various project components, and the substantive input in scoping by the public, stakeholders, and agencies.

To fully consider the issues identified in the scoping comments, this alternatives development process used the concept of "options," which consist of variations of components of Pebble Limited Partnership's (PLP) proposed Pebble Project. For example, an option for transporting concentrate from the mine site could be a slurry pipeline instead of using trucks. Individual pipeline route variations would also be considered as options.

The four steps followed for alternatives development are summarized below.

Step 1—Developed the criteria for screening options to the proposed project. The screening criteria are described in detail below in Section B1.2, Screening Criteria for the Full Range of Alternatives (Step 1).

Step 2—Identified options to address scoping concerns, compiled options that were suggested during the scoping process, and identified options that were previously evaluated by PLP when developing the proposed project design. These options represent the range of alternatives (Table B-1) organized by project component. Additional options were suggested by cooperating agencies during development of the Draft EIS (DEIS), and were added to Table B-1. Additionally, the USACE reviewed the logical termini (e.g., mine site and marine ports), physical constraints such as mountains, and land status such as national parks, to develop a full range of transportation options.

Step 3—Applied screening criteria from Step 1 to the options developed in Step 2. The criteria were used to determine reasonable and practicable options for detailed analysis in the EIS. Results of this screening are included in Table B-1, including rationale for the options eliminated from further analysis.

Step 4—Organized options that met all of the screening criteria into viable action alternatives for detailed analysis in the EIS. In this context, an action alternative is a complete, functioning project that includes power, a port, transportation, and mine site facilities.

B1.2 SCREENING CRITERIA FOR THE FULL RANGE OF ALTERNATIVES (STEP 1)

The EIS team screened options around three criteria, described below. The criteria screening steps were followed sequentially. If an option clearly did not meet one of the test-screening criteria, it was eliminated from further consideration, and did not proceed to the subsequent screening tests; however, in several instances it was not possible to make a definitive determination, and the options were advanced to the next step.

The criteria were used to guide the screening process, not to mechanically generate outcomes that substitute for professional judgment. Accordingly, these screening criteria were not used as filters to judge fine distinctions or make close calls, which would instead be addressed in the analyses in the EIS.

B1.2.1 Screening—Purpose and Need

The project purpose and need is a key element of alternatives development. A permit applicant's stated purpose and need is used as part of the National Environmental Policy Act (NEPA) process to inform a reasonable range of alternatives to a proposed project; and the applicant's stated need is used by the USACE to determine the overall purpose, which is used for evaluating practicable alternatives under the Clean Water Act (CWA) Section 404(b)(1) guidelines (hereafter identified as 404(b)(1) guidelines). The purpose and need statements for the project are detailed in Chapter 1, Purpose and Need.

PLP's (i.e., the Applicant) stated purpose is to produce commodities, including copper, gold, and molybdenum, from the Pebble deposit in a manner that is commercially viable, using proven technologies that are suitable for the project's remote location. PLP's stated need is to meet the increasing global demand for commodities such as copper, gold, and molybdenum.

Although the USACE considers an applicant's stated purpose and need for a proposed project, in all cases the USACE exercises independent judgment in defining the purpose and need from both the applicant's and the public's perspective. The USACE has determined that the Applicant's stated purpose is made too narrow by limiting the proposed development to the Pebble deposit. The public's interest in commodities such as copper, gold, and molybdenum does not dictate a particular source of these commodities and the public has also expressed interest in protecting the state's natural resources, such as fisheries. Additionally, although the Applicant has identified a need for these minerals and the USACE assumes that a private applicant has completed appropriate economic evaluations and proposed a project that is needed in the marketplace, the primary minerals—copper, gold, and molybdenum—are not mineral commodities considered to be critical to the economic or national security of the US as reflected in Executive Order 13817, "A Federal Strategy to Ensure a Reliable Supply of Critical Minerals." However, the public also has an interest in improving the economy of the state, in the creation of jobs in the state, and in the extraction of natural resources for the benefit of the state. This is demonstrated by scoping comments, which indicated a desire to bring economic opportunity and jobs to the region, as well as by policy language in the Alaska State Constitution and Alaska Statutes encouraging development of the state's mineral resources consistent with the public interest.

An overall project purpose is determined solely by the USACE, while considering the applicant's and the public's perspective, and is used to help identify practicable alternatives. Any overall purpose must seem feasible and take into account the need for the type of proposed development. The USACE has determined that the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand.

USACE's overall project purpose was used to assess options under this first screening test. Options that did not meet the USACE's overall project purpose were eliminated from consideration as an action alternative for evaluation in the EIS and did not proceed to the subsequent screening test. Options that met the overall project purpose advanced to the next screening test.

B1.2.2 Screening—Reasonable and Practicable Options

Screening criteria drew on the NEPA regulatory intent of reasonable alternatives, which include those that are practical or feasible from the technical and economic standpoint, and using common sense. Types of options that would not pass this test of reason include:

- Those not practical from a technical or economic standpoint
- Those suggested during scoping that are not specific, or are substantially similar to other options being considered
- Those suggested that were based on a misunderstanding of the project, regulations, or conclusions of other reports or studies

In terms of practicability, the 404(b)(1) guidelines provide a two-fold definition of a practicable alternative (40 Code of Federal Regulations [CFR] Part 230.10[a][2]):

1. A practicable alternative is one that is available and capable of being done after taking into consideration cost, existing technology, and logistics.[1]
2. The three practicability criteria (cost, existing technology, and logistics) apply in light of the overall project purpose.

When making a determination of practicability based upon cost, the determination does not rest upon the applicant's financial standing. Rather, a determination of practicability based upon cost considers the characteristics of the project and whether the projected cost of an alternative constitutes a reasonable expense for this type of project. A determination of whether the projected cost is unreasonable should generally consider whether the projected cost is substantially greater than the costs normally associated with the particular type of project.

Determinations of practicability based upon existing technology and logistics consider whether alternatives are too complex or use unproven technology. Options identified for a specific project component may be subject to technical constraints that affect the workability of the option. For example, topography, resource needs, spatial relationships of one component to another, temporal sequences, operating considerations, safety requirements, or engineering data for a specific option may influence whether a particular option is capable of meeting the project objectives. The existing technology and logistics criteria consider the ability of each option to meet these challenges.

Options that were assessed as not available or clearly not reasonable or practicable in terms of cost, existing technology, and logistics in light of the overall project purpose were eliminated from detailed consideration in the EIS.

B1.2.3 Screening—Environmental Impacts

In addition to an evaluation of practicability, the 404(b)(1) guidelines require an evaluation of the environmental effects of a proposed alternative to determine whether there are practicable alternatives to the proposed project that would have less adverse impacts on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences (40 CFR Part 230.10[a]). Therefore, options that progressed through the screening criteria above were evaluated and compared for their relative extent and nature of

[1] The guidelines state that if an alternative is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed in order to fulfill the overall purpose of the proposed activity may be considered a practicable alternative. In other words, the fact that an applicant does not own an alternative parcel does not preclude that parcel from being considered as a practicable alternative.

impacts on the physical, biological, and socioeconomic environments. Note that at this screening stage, most assessments of environmental impacts were qualitative.

Based on this assessment, options that would not have less environmental damage than the relevant component(s) of the Applicant's proposal were eliminated from further consideration as an action alternative option for evaluation in the EIS. Options that had potentially greater adverse impacts to one or more resources, but potentially fewer adverse impacts to other resources (i.e., trade-off of impacts), and options that clearly provided avoidance or minimization advantages (i.e., a reduction of environmental impacts) progressed as viable options and were evaluated as components of action alternatives in the EIS. Additionally, where two feasible options, amongst all the alternatives, were generated to avoid or minimize an impact, the option with greater impacts was eliminated from further study.

B1.3 ALTERNATIVES DEVELOPMENT RESULTS

Table B-1 provides details on the options considered, the screening results, and the outcome of each option. The components and subcomponents of PLP's project are included in Table B-1 for comparative purposes. Figure B-1 depicts the access and pipeline alignments considered. Figure B-2 illustrates the mine layout options considered. Figure B-3 illustrates tailings storage facility (TSF) location options considered. Figure B-4 illustrates the main Water Management Pond (WMP) location options considered.

The end result was to identify a reasonable range of action alternatives for full analysis in the EIS. Options that met screening criteria were packaged into action alternatives (i.e., a functioning project including power, a port, transportation, and mine facilities).

Four major action alternatives, listed below, and further described in Chapter 2, Alternatives, have been carried forward for full analysis in the EIS. Variations to components of the project that do not comprise a complete alternative are analyzed as variants under action alternatives. Although a variant may be analyzed under a specific alternative, the USACE's determination of the least environmentally damaging practicable alternative (LEDPA) in its final permit decision may include a combination of alternatives and variants analyzed in the EIS.

Alternative 1a—This alternative, identified based on comments on the DEIS and continued project optimizations, is composed of components from Alternative 1 and Alternative 2 analyzed in the DEIS. It consists of PLP's proposed mine site (center line construction for the bulk TSF main embankment); a transportation corridor with a mine access road to a ferry terminal at Eagle Bay, with a south crossing of Newhalen River; a ferry crossing of Iliamna Lake to a south ferry terminal west of Kokhanok; continuation of the transportation corridor with a port access road to the western side of Cook Inlet; a port at Amakdedori with a caisson dock design; and a natural gas pipeline from the Kenai Peninsula to the mine site with five main segments: 1) Cook Inlet crossing to the Amakdedori port; 2) along the port access road to Iliamna Lake; 3) across Iliamna Lake to Newhalen; 4) overland to connect with the mine access road east of the Newhalen River crossing; and 5) along the mine access road to the mine site. No variants are analyzed under the Alternative 1a.

Alternative 1—The base case for Alternative 1 is PLP's original proposed Pebble Project, described in detail in the DEIS, with minor project optimizations to avoid and minimize environmental impacts. Alternative 1 includes PLP's proposed mine site (centerline construction for the bulk TSF main embankment); a transportation corridor with a mine access road in the Upper Talarik Creek (UTC) watershed to a north ferry terminal; a ferry crossing of Iliamna Lake to a south ferry terminal west of Kokhanok; continuation of the transportation corridor with a port access road to the western side of Cook Inlet; a port at Amakdedori with an earthen fill causeway and sheet pile jetty design; and a natural gas pipeline from the Kenai Peninsula to the mine site

with four main segments: 1) Cook Inlet crossing to the Amakdedori port; 2) along the port access road to Iliamna Lake; 3) across Iliamna Lake to the north ferry terminal; and 4) along the mine access road to the mine site. Three variants have been analyzed that would modify minor project features.

Alternative 2—This alternative, termed the North Road and with Downstream Dams Alternative, is an alternative that would reduce the overall length of access roads and use alternate methods for construction of the bulk TSF. It consists of the same mining methods and facilities as Alternative 1a, but uses downstream construction methods for the bulk TSF; a transportation corridor with a mine access road to a ferry terminal at Eagle Bay, with a southern crossing of Newhalen River; a ferry crossing of Iliamna Lake to a south ferry terminal near Pile Bay; continuation of the transportation corridor with a port access road to the western side of Cook Inlet; a port at Diamond Point with an earthen fill causeway and sheet pile jetty design; and a natural gas pipeline from the Kenai Peninsula to the mine site with three main segments: 1) Cook Inlet crossing coming ashore at Ursus Cove; 2) northward to Diamond Point port; and 3) overland to the mine site, following along the port and mine access roads with a pipeline-only segment between. Alternative 2 has two of the same variants identified for Alternative 1, as well as a variant for a north crossing of the Newhalen River.

Alternative 3—This alternative, termed the North Road Only Alternative, is being considered, along with one additional variant, because it would provide an alternative transportation corridor and natural gas pipeline route, and would eliminate the need for ferry transportation across Iliamna Lake. Alternative 3 includes the proposed mine site; a transportation corridor with a north access road from the mine site to the western side of Cook Inlet, with a southern crossing of Newhalen River; a port north of Diamond Point with a caisson-supported dock design; and a natural gas pipeline that follows the same general route from the Kenai Peninsula to the mine site as Alternative 2.

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Mine Location and Layout Options			
Location—Pebble West	LOC-001	***Origination—***This is PLP's proposed project. ***Description—***The project involves development of a copper-gold-molybdenum porphyry deposit (Pebble deposit) on State land in the Bristol Bay region of southwest Alaska. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Location—Whistler Project	LOC-002	***Origination—***Evaluating alternative mine location options for mining copper, gold, and molybdenum was suggested during scoping.[2] ***Description—***The Whistler mineral property is a gold-copper porphyry deposit in the Yentna mining district northwest of Anchorage. Molybdenum resources have not been reported at Whistler. ***Screening—*** 1. Purpose and Need Test: Whistler does not contain molybdenum (Athey and Werdon 2017), and therefore does not meet the overall purpose and need. ***Why Eliminated—***This option does not meet the overall project purpose because Whistler does not contain molybdenum.	Eliminated from further analysis
Location—Pyramid Project	LOC-003	***Origination—***Evaluating alternative mine location options for mining copper, gold, and molybdenum was suggested during scoping. ***Description—***Pyramid is a copper-gold-molybdenum porphyry deposit on the southwestern tip of the Alaska Peninsula southwest of Anchorage. Pyramid is classified as an early-stage exploration project by SRK Consulting (SRK 2018b). Exploration to date at the Pyramid property has characterized only inferred resources.	Eliminated from further analysis

[2] For LOC-002, LOC-003, and LOC-005, which evaluate alternate mine location options in Alaska, potential alternative mineral deposits were identified by reviewing the yearly comprehensive report of mineral deposits in the state of Alaska (Athey and Werdon 2017).

Table B-1: Project Options Considered

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		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: An inferred mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. It is not possible to determine the technical and economic feasibility of developing a mine based only on inferred resources. It would be extremely expensive to conduct additional exploration to identify if measured and indicated resources exist at Pyramid (e.g., PLP has spent approximately $700 million to date on exploration), and it is unknown at this time if such a program would identify adequate resources to plan mine development at Pyramid. Therefore, it is concluded that resources at Pyramid are not known and not available. Unavailable alternatives are not practicable. ***Why Eliminated—***There are no assurances that the resources exist in the necessary quantity and quality. Due to the high cost of exploration in remote or speculative locations, the USACE determined it would be unreasonable to require consideration of alternatives with no known reserves. Therefore, it is concluded that this option is not practicable.	
Location—Outside of Alaska	LOC-004	***Origination—***Evaluating alternative mine location options for mining copper, gold, and molybdenum was suggested during scoping. ***Description—***This option involves acquisition, development, and operation of a copper-molybdenum deposit outside of Alaska. ***Screening—*** 1. Purpose and Need Test: Does not meet the USACE's overall project purpose to develop and operate a mine in Alaska. ***Why Eliminated—***The USACE determined that the Applicant's stated purpose to produce commodities from the Pebble deposit would overly constrain the evaluation of	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		locational alternatives. To develop the EIS purpose and need statement pursuant to NEPA regulations (40 CFR Part 1502), the USACE focused on PLP's statement, exercising independent judgement in defining purpose and need for the project from both PLP's and the public's perspective. The USACE determined that the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska to meet current and future demand. This option does not meet the overall purpose of the project.	
Location—Massive Sulfide Deposits in Alaska	LOC-005	***Origination—***Evaluating alternative mine location options for mining copper, gold, and molybdenum was suggested during scoping. ***Description—***This option involves development and operation of a multi-metals massive sulfide deposit in Alaska. Five massive sulfide deposits in Alaska (Arctic, Delta, Niblack, Palmer, and Sun) with copper resources were evaluated. Indicated resources ranged from 26 million tons (Arctic) to no indicated resources (Delta and Palmer). By contrast, for the Pebble deposit, over 12 billion tons of measured (591 million tons), indicated (6.5 billion tons), and inferred (4.9 billion tons) resources are reported. None of these deposits reported molybdenum resources (Athey and Werdon 2017). ***Screening—*** 1. Purpose and Need Test: These deposits do not contain molybdenum, and therefore do not meet the Purpose and Need. ***Why Eliminated***—These deposits do not contain molybdenum and do not meet the overall project purpose.	Eliminated from further analysis
Location—Pebble East	LOC-006	***Origination—***Evaluating alternative mine location options for mining copper, gold, and molybdenum was suggested during scoping. ***Description—***This option would develop Pebble East instead of the proposed Pebble West using either an open pit mine or underground mining methods. PLP completed an evaluation of mining Pebble East in response to Request for Information (RFI) 094 (PLP 2018-RFI 094). An open pit mine scenario would require stripping 2,000 feet of	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		waste to access the ore. An underground mine scenario would require development of a 3,500-foot-deep, 24-foot-diameter shaft, 2,200 feet of lateral development, and significant underground work to first determine if underground mining is feasible; and if so, confirm the mining plan/design. Both scenarios would require a more extensive and deeper dewatering program than the proposed project. ***Screening—*** 1. Purpose and Need Test: Meets the Purpose and Need. 2. Reasonable and Practicable Test: Both scenarios may be practicable; however, a conclusive evaluation of practicability would require more than a screening-level effort. Therefore, this option is forwarded to the next screening step. 3. Environmental Impacts Test: The open pit scenario for Pebble East would increase direct wetlands impacts by approximately 2,600 acres, compared to the proposed project at Pebble West. The underground mine scenario for Pebble East would have a subsidence zone of approximately 2,000 acres, portions of which could open into holes that are 1,000 feet or deeper. The underground mine subsidence zone for Pebble East would increase wetlands impacts by approximately 1,100 acres compared to the proposed project. Either scenario would directly impact Upper Talarik Creek (UTC), and have additional indirect impacts from a deeper and more extensive dewatering program than required for Pebble West. ***Why Eliminated—***Developing Pebble East instead of Pebble West using either open pit or underground mining methods would increase adverse environmental impacts.	
Layout—Proposed Mine Layout	LAY-001	***Origination—***This is PLP's proposed mine layout. ***Description—***This option is based on a mining plan that sends all ore directly to the mill. It has two separate TSFs; a lined pyritic TSF with space to store PAG waste in the NFK East site; and an unlined bulk tailing TSF in the NFK West site. A lined WMP would be situated in the NFK North site. The bulk TSF would have a dry closure. The	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		pyritic tailings and PAG waste would be relocated to the pit lake at closure, and the pyritic TSF and WMP would be reclaimed. This option facilitates post-closure placement of PAG waste and pyritic tailings in the pit lake, and enables a higher efficiency for the storage of bulk tailings. This option removes the need to store low-grade ore and manage associated runoff, and provides greater water storage capacity for upset conditions. The WMP is downgradient of impacted areas, facilitating capture and storage of extreme runoff events. This option also allows for passively managed long-term storage of the pyritic tails and PAG waste in the pit lake. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	
Layout—Single TSF with Two Cells	LAY-002	***Origination—***This mine layout option was PLP's proposed project in the December 2017 DA permit application (PLP 2017). PLP's May 11, 2018 update changed the proposed mine layout to LAY-001. ***Description—***This option is based on a mining plan that would require stockpiling capacity for LGO that is processed late in the mine life. PAG waste and LGO would be stored in a lined facility in the NFK East site. The main WMP would be constructed north of the NFK East site. A single TSF with separate cells for bulk and pyritic tailings would be constructed in the NFK West site, with an internal embankment between the cells. The pyritic TSF would be lined. The bulk TSF would not be lined. The bulk TSF would have a dry closure. The pyritic TSF would have a wet closure. The LGO/PAG waste storage facility would be reclaimed. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This layout was originally part of PLP's proposed project; and on that basis, is assumed to be reasonable and practicable.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		3. Environmental Impacts Test: This option would have a smaller WMP, which would reduce the total footprint and impacts to wetlands. However, this option requires long-term (centuries) maintenance of the pyritic TSF in a subaqueous state, and seepage collection into perpetuity. The exposed LGO and PAG waste rock would also be likely to become acidic when exposed to the atmosphere, resulting in acidic drainage and increased metals leaching. A primary scoping concern was that tailings could flow from a dam failure and this option increases the probability of a failure. Scoping comments also expressed doubt that a TSF could be maintained in a subaqueous state into perpetuity. The proposed project would return the pyritic tailings and PAG waste rock to the completed pit at closure, avoiding the need for long-term maintenance of the pyritic TSF. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal based on the requirement to maintain the pyritic TSF, and capture and treat seepage water into perpetuity. Additional water quality degradation would result from storing the LGO and PAG waste rock in open stockpiles. Although PLP would be required to collect and treat the water, preventing the LGO and PAG waste rock from becoming acidic is preferable.	
Layout—Single TSF with Single Cell	LAY-003	***Origination—***This mine layout option was evaluated by PLP when developing the project design. ***Description—***The TSF would be constructed in the NFK West site, and consist of a single cell with an internal area to store the pyritic tailings so that they remain subaqueous. A lined WMP with space to store PAG waste would be constructed in the NFK East site. The tailings would have wet closure, and the WMP would be reclaimed. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option is practicable. It requires less fill material, because there is no internal embankment; and it requires that all tailings be maintained in a subaqueous state in perpetuity. There are no	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		proven methods of segregating two tailings streams in one cell that would permanently keep the pyritic tailings separate from the bulk tailings during operations, while the TSF progressively increases in size, to prevent the co-mingling of the two supernatant waters, and prevent contact of the two entrained waters concurrently with maintaining the flow-through seepage concept of the bulk TSF. 3. Environmental Impacts Test: This option would not be less environmentally damaging than the Applicant's proposal. Seepage water quality for all of the tailings would be impacted by the pyritic tails. Re-handling of the pyritic tails for storage in the pit lake would be precluded, and the TSF would need to be maintained in a subaqueous state. The dam and water cover would need to be inspected and maintained long-term (centuries) to prevent acid generation, dam failure, and tailing flows. A primary scoping concern was that tailings could flow from a dam failure and this option would increase that risk. Scoping comments also expressed doubt that a TSF could be maintained in a subaqueous state into perpetuity. ***Why Eliminated—***This option would increase overall adverse impacts from reduced seepage water quality and the requirement to maintain the TSF into perpetuity.	
Mine Size—EPA Restricted Mine Size	LAY-004	***Origination—***An alternative suggested during scoping was to restrict the size of the mine to what the EPA found appropriate in the 2014 Watershed Assessment (EPA 2014). ***Description—***This option would restrict the size of the mine to what the EPA found appropriate in the 2014 Watershed Assessment. EPA identified 3 mine scenarios in its 2014 Watershed Assessment, but never determined any of them to be appropriate. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable Test: This option is not reasonable because EPA did not make a determination in the Watershed Assessment that any of the 3 mine scenarios they considered would be "appropriate."	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Why Eliminated—This option is premised on a misunderstanding of EPA's Watershed Assessment, which did not determine that any smaller mine size would be appropriate. Accordingly, the mine size applicable under LAY-004 is not determinable, and therefore fails the reasonableness screening criteria. See also LAY-005.	
Mine Size—Smaller Mine Pit Size	LAY-005	***Origination—***Consideration of a smaller pit mine size was evaluated by USACE as a potential means to reduce project footprint, as well as surface, water, and other environmental impacts. ***Description—***This option examines the smallest mine size considered by the EPA in the 2014 Watershed Assessment (EPA 2014). Under this option, 0.23 billion metric tons of ore would be mined, with a throughput of 31,100 metric tpd. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option has a lower throughput than TPD-002, which evaluated a 50,000-tpd option. An optimization study (PLP 2018-RFI 059) showed that option TPD-002 would have a negative NPV, due to the fixed infrastructure component of the costs. LAY-005 would have a lower (greater negative) NPV than TPD-002. Alternatives that require private industry to operate without profit for any appreciable period of time cannot be judged reasonable or practicable (by standards established in the 404(b)(1) guidelines). ***Why Eliminated—***This option is not reasonable or practicable. See also TPD-002.	Eliminated from further analysis
Mine Size—Larger Mine to Develop More of the Known Deposit	LAY-006	***Origination—***Evaluation of options to maximize the potential economic benefits of developing the deposit, such as a larger and longer-lived mine, was suggested during scoping. ***Description—***This option would increase the mine site and duration of operations to develop more of the known and inferred resource of the overall deposit.	Included as a Reasonably Foreseeable Future Action (RFFA) in the EIS

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Practicability is unknown at this time, but Northern Dynasty Minerals Ltd. has communicated to shareholders that expanded development is possible (NDM 2013). 3. Environmental Impacts Test: This option would increase environmental impacts by generating additional tails and other non-economic material that would need to be stored on site. Additionally, the mine would operate longer, prolonging the duration of operations impacts. ***Why Eliminated—***This option exceeds the scope of the project, and would increase overall adverse impacts. The USACE is required to evaluate the Applicant's project, as proposed in the Department of Army permit application. Future expansion of the mine has been determined reasonably foreseeable by the USACE, and an expansion scenario developed and analyzed as a cumulative effect in the EIS. The USACE cannot legally analyze mining the entire resource as the proposed project, nor can they analyze the expansion scenario as an additional alternative.	under cumulative effects
Mining Options			
Mining Type—Surface Mining	MNG-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which includes developing the Pebble West resource using open pit mining methods. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Mining Type—Underground Mining	MNG-002	***Origination—***Underground mining was evaluated by PLP when developing the proposed project design, and was suggested for consideration during scoping. ***Description—***This option would develop Pebble West using underground mining methods. The Pebble West deposit is close to the surface. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The Pebble West deposit is close to the surface, with minimal overburden or overlying waste rock. Underground mining of this deposit would be expected to result in a mine roof collapse, ground surface subsidence, and sinkhole formation. Existing underground mining techniques cannot be used to mine the project because the remaining surface material would collapse. ***Why Eliminated—***This option is not practicable for Pebble West.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Mining Type—Surface and Underground Mine	MNG-003	***Origination—***A combination of surface and underground mining was evaluated by PLP when developing the project design, and was suggested for consideration during scoping. ***Description—***This option would develop the Pebble West resource using both open-pit and underground mining methods. PLP's proposed project would develop the portion of the deposit that is close to the surface. If the mine were expanded in the future (see LAY-006), some combination of surface and underground methods would likely be proposed. See also MNG-002. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The portion of the Pebble deposit included in the project is at the surface, with minimal overburden or overlying waste rock. Underground methods to include block caving of this portion of the deposit would be expected to result in a mine roof collapse, ground surface subsidence, and sinkhole formation. Existing underground mining techniques cannot be used to safely mine the project because the remaining surface material would collapse. ***Why Eliminated—***This option is not practicable using existing technology for the portion of the deposit that is proposed for mining. Open pit and underground block caving is a method that would be considered in the future if mine expansion is proposed (PLP 2018-RFI 062). An expanded mine scenario is considered in the EIS, Chapter 4, Environmental Consequences, under cumulative impacts, and it assesses surface and underground mining techniques.	Eliminated from further analysis
Material Handling—Truck and Shovel	MNG-004	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which involves use of large shovels to load ore into haul trucks. The trucks would transport the ore from the pit to the crusher. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Material Handling—In-Pit Crushing and Conveying	MNG-005	***Origination—***In-pit crushing and conveying (IPCC) can reduce operating costs at some mines by reducing truck haulage and associated fuel consumption and road construction. IPCC was evaluated by PLP when developing the project design. PLP completed an engineering evaluation of IPCC in response to RFI 032, which requested feasibility information for several project options (PLP 2018-RFI 032). PLP conducted additional analysis of the option in response to RFI 090 (PLP 2018-RFI 090). ***Description—***This option would use in-pit crushing and conveying methods for material handling that would begin in approximately Year 14 of the 20-year mine life. This option would excavate a dedicated crusher pocket and ramp to transport ore via a conveyor to the processing facility. The additional excavation associated with the crusher pocket and ramp would generate additional PAG waste, which would require 2 additional 25-foot raises for the pyritic TSF. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: In-pit crushing can be a practicable material-handling option; however, it is more commonly implemented at some point later in mine life, as the open pit is developed, and the installed crushing and conveying system can remain stationary for an extended period. 3. Environmental Impacts: This option would generate an additional 81 million tons of waste rock, of which 71 million tons would be PAG. It would reduce truck hours by approximately 21,000 hours, but would require 600,000 MWh of energy for the conveying system, resulting in an overall increase in the energy requirements compared to the proposed project. The option would also increase the footprint of the proposed open pit and pyritic TSF by 231 acres, including 71 acres of wetlands. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Truck Fuel—Diesel	MNG-006	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, in which large-haul trucks are equipped with diesel engines and would use most of the anticipated diesel supplies. This option requires the shipment of diesel to the mine site. There would be two 500,000 gallon diesel storage tanks at the mine site, and four 1.25-million-gallon storage tanks at Amakdedori port. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Truck Fuel—Liquefied Natural Gas	MNG-007	***Origination—***Using liquefied natural gas (LNG) to fuel the mine haul trucks was evaluated by PLP. Use of alternative truck fuel was also suggested during scoping. ***Description—***Under this option, LNG would be produced on site using natural gas from the proposed pipeline. The LNG plant would be assembled on site from truckable modules, and LNG storage tanks would be manufactured off site. An engineered footprint for the facility has not been developed, but it would have a footprint of approximately 1 acre, based on similar facilities. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: On-site production of LNG would be practicable because there would be a natural gas pipeline to the mine site, and LNG plants of the size required are readily available and transportable. However, LNG-powered haul trucks are not commercially available for the mining industry, and are not proven to be viable on a production basis. There are currently no trucks available in the required size range. ***Why Eliminated—***This option is not available, and therefore not practicable.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Processing Options			
Facility Location/ Process Type— On-site Concentrate Production	PRO-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, in which the initial processing of ore would be conducted on site to produce a concentrate that would be transported off site for smelting. PLP estimates the annual production to be approximately 660,000 tons of copper-gold concentrate, and 16,500 tons of molybdenum concentrate. Project transportation would include up to 35 truck roundtrips per day, one ferry round trip per day, and 27 bulk carrier ships per year. About 10 trips by the lightering barges would be required to load each bulk carrier. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Facility Location— Off-site Ore Processing	PRO-002	***Origination—***Off-site ore processing was evaluated by PLP as an option when developing the project design. Evaluation of alternative locations for ore processing was also suggested during scoping. ***Description—***Off-site ore processing would involve transporting all ore away from the project area for processing. This would involve transportation of 180,000 tons of ore from the mine site to the mill site daily. This would require approximately 100 times the proposed truck, ferry, lightering barge, and ship traffic. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Off-site processing presents a series of challenges in terms of cost and logistics, which appear to make this option not practicable: • Requires large amounts of fuel and equipment to transport the non-mineralized portion of the ore. • Requires transportation of more than 100 tons of unprocessed rock every minute, which would require almost continuous truck traffic, 24 hours per day, every day of the year.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		• The increased amount of infrastructure required off site and for transportation purposes would broaden the project footprint. • Off-site processing would substantially increase costs. 3. Environmental Impacts Test: There would be increased traffic and potentially additional infrastructure required to transport the rock, resulting in elevated air emissions, diesel consumption/carbon footprint, visual impacts, noise levels, dust, wildlife impacts, and wetland impacts. ***Why Eliminated—***This option would increase overall adverse impacts, and would not be practicable in terms of costs and logistics.	
Facility Location/ Process Type— On-site Ore Processing (Metal Production)	PRO-003	***Origination—***On-site processing to produce metals instead of concentrate was evaluated by PLP as an option when developing the project design. ***Description—***The option would construct a smelter and produce metals on site (copper, gold, and molybdenum) instead of a concentrate product. On-site smelting would require developing additional land for the facility and disposal of smelting waste. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Smelting at a large, existing, established ore-processing facility would be less expensive than constructing and operating a smelter at the mine site. However, cost estimates have not been developed, so the option is advanced to the next screening step. 3. Environmental Impacts Test. Constructing additional smelting and waste disposal facilities would increase impacts to wetlands and other waters. During operations, on-site smelting would reduce trucking and ship traffic, but move associated air emissions from an existing smelter to the project area. Increased air emissions would result from increased natural gas usage (thermal heating of the ore and increased power generation) and heavy metals escaping the ore-heating step. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the project.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Facility Location/ Process Type— Mine Landfills to Produce Copper, Gold, and Molybdenum	PRO-004	***Origination—***Mining landfills to produce copper and precious metals was suggested as an alternative during the public comment period of the DEIS. ***Description—***The option would excavate and process landfilled waste to extract copper and other precious metals. ***Screening—*** 1. Purpose and Need Test: This option would not meet the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand. ***Why Eliminated—***This option would not meet the purpose and need.	Eliminated from further analysis
Facility Location/ Process Type— Reuse and Recycling of Copper Products	PRO-005	***Origination—***Reuse and recycling of copper products and Information Technology (IT) equipment was suggested as an alternative to developing the mine during the public comment period of the DEIS. ***Description—***The option would recover, reuse, and recycle copper products already mined. ***Screening—*** 1. Purpose and Need Test: This option would not meet the overall project purpose to build a mine. Additionally, copper is valuable, easily recycled, and most copper that has ever been produced in the world is still in use. Additional reuse and recycling would not be able to meet the growing demand for copper. ***Why Eliminated—***This option would not meet the purpose and need.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Throughput Options			
180,000 tons per day	TPD-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which includes mine throughput of 180,000 tpd over a 20-year mine life. It is a revision of the previously proposed 160,000-tpd throughput. A throughput of 180,000 tpd eliminates the need for a LGO/ PAG storage facility, which would require 4 additional years of processing at the end of operations. This option reduces the mine footprint from the originally proposed 160,000-tpd throughput. This option would have an NPV of $1,028,388 at a discount rate of 7 percent. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
50,000 tons per day	TPD-002	***Origination—***This option was evaluated by PLP as an option when developing the project design. ***Description—***This option would produce the same amount of concentrate as the proposed project, but would have a throughput of 50,000 tpd. At this lower throughput, the mine life would be 71 years. The transportation corridor, port, and natural gas pipeline would still be required. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The Technical Note on Optimization Studies prepared by PLP in response to RFI-059 addressed the economics of this option (PLP 2018-RFI 059). The optimization study showed that with this option, the overall project would have an NPV of -$2,301,785, due to the fixed component of the costs. Alternatives that require private industry to operate without profit for any appreciable period of time cannot be judged reasonable or practicable (by standards established in the 404(b)(1) guidelines). ***Why Eliminated—***This option is not reasonable or practicable	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
115,000 tons per day	TPD-002a	***Origination—***This option was suggested by a cooperating agency. ***Description—***This option would produce the same amount of concentrate as the proposed project, but would have a throughput of 115,000 tpd. At this lower throughput, the mine life would be 31 years. The transportation corridor, port, and natural gas pipeline would still be required. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The response to RFI-059a by PLP addressed the economics of this option. With this option, the project would have an NPV of -$220,985, due to the fixed component of the costs. Alternatives that require private industry to operate without profit for any appreciable period of time cannot be judged reasonable or practicable (by standards established in the 404(b)(1) guidelines). ***Why Eliminated—***This option is not reasonable or practicable.	Eliminated from further analysis
160,000 tons per day	TPD-003	***Origination—***This option was originally proposed by PLP in the December 2017 DA permit application. This option was replaced by the 180,000-tpd throughput as PLP's proposed project. ***Description—***This throughput option of 160,000 tpd was a component of a project that would require: • Construction of a large, lined pad for storing PAG waste rock and LGO (PAG waste rock would be returned to the completed pit at closure, and LGO would be processed during the later years of mine operations) • Perpetual aboveground maintenance of the pyritic TSF in a subaqueous condition • Storage of excess water during operations in the bulk and pyritic TSFs • Peak mining rate of 90 million tons per year	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This throughput is appropriately sized to process the targeted ore resource using a standard processing plant design and equipment. 3. Environmental Impacts Test: This option would require a large low-grade ore stockpile facility, which would generate significant amounts of poor-quality runoff water and seepage; the proposed project would not require stockpiling low-grade ore. This option would require perpetual maintenance of a water cover on an aboveground pyritic TSF, which would have an increased risk of failure and contribute to poor-quality seepage; the proposed project would contain the pyritic tailings in the mined pit where the pit lake would provide the water cover to minimize oxidation. Storage of excess contact water in the TSFs would increase the potential for failure of the TSF embankments compared to the proposed project, which would store excess water in the main WMP. This option's peak mining rate of 90 million tons per year is 20 million tons per year greater than the proposed project rate, which would increase the mobile equipment and power plant emissions impacts. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	
320,000 tons per day	TPD-004	***Origination—***This option was evaluated by PLP when developing the project design. ***Description—***Mine throughput of 320,000 tpd would develop the resource in 11 years instead of the 20 years that is proposed. It is assumed that this throughput option would result in the same mine pit and TSF footprint over a shorter period. Due to higher production levels, it would likely increase the size of the processing facilities; accelerate the tailings deposition rate and TSF embankments raise schedule; and increase the volume of concentrate transported over a shorter period of time. This in turn would increase the volume of truck and ferry traffic on the transportation system, and increase activities associated with the port facility, including the number of	Eliminated from further analysis

Table B-1: Project Options Considered

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		lightering and marine-ore transport vessels. This option would have an NPV of $2,257,666 (PLP 2018-RFI 059). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Construction and commissioning of a new plant this size would present significant execution, manpower, logistical, cost management, and other challenges that elevate project risk. It would require additional processing facilities. The significantly shorter mine life is not long enough to ensure that project operations can pass through several economic cycles and potential fluctuation in metals prices. However, it is likely practicable. 3. Environmental Impacts Test: This option would cut the life of mine operations nearly in half, reducing the time period of operational impacts. The footprint of mine pit and TSFs would remain the same, but would require addition footprint for processing facilities. This throughput level would nearly double the volume of ore processed, increasing the volume of ore concentrate truck traffic on the road and ferry systems. It would also increase the frequency of activities associated with marine transport, including lightering operations and marine-ore ship traffic. ***Why Eliminated—***Although this option would reduce the period of operations, it would increase overall environmental impacts, including the processing facility footprint, and truck, ferry, and marine operations traffic levels compared to the Applicant's proposal.	
Gold Recovery Options			
Gravity	GR-001	***Origination—***This is PLP's proposed project. ***Description—***The project includes use of gravity separation methods to recover gold. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives

Table B-1: Project Options Considered

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Secondary Gold Recovery	GR-002	***Origination—***The use of a cyanide leach circuit for ore recovery was examined by PLP and recommended for consideration in scoping comments as a means to increase the efficiency of ore recovery. ***Description***—This option involves construction of a cyanide leach circuit at the mine site to process the pyritic tails. A cyanide leach circuit could recover additional gold from the process. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Cyanide leaching is a common practice and would likely be technologically and economically feasible. 3. Environmental Impacts Test: Cyanide is toxic to aquatic organisms, wildlife, and humans. PLP has opted to forgo a cyanide leach circuit and the additional gold recovery it would provide because of public concern regarding adverse environmental impacts from the use and transportation of cyanide. Additionally, the leach facility would have a large footprint that would impact wetlands. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	Eliminated from further analysis
Power Options			
Power Source—Thermal (Burn Natural Gas)	POW-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which involves power generation using natural gas as a fuel source. PLP is proposing to build a power plant at the mine site with a capacity of 270 MW. The plant would be fueled with natural gas delivered from the Kenai Peninsula to the mine site. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Power Source—Renewable Energy	POW-002	***Origination—***Renewable energy power options were evaluated by PLP when developing the project design. ***Description—***Under this option, PLP would construct and power the mine using renewable energy resources such as wind turbines, solar, and ROR hydropower. Also considered under this option is supplementing the natural gas power plant production with renewables. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The three separate renewable options listed below were considered under this option. These options would supply power intermittently and in small quantities relative to the need, and would not eliminate the need for the proposed natural gas power plant and pipeline. These options would intermittently supply power that would decrease the demand on the natural gas power plant, potentially resulting in decreased usage of natural gas. Each option would require additional access roads and ground disturbance to transmit power to the mine. • Wind—Wind energy generation is intermittent and must be paired with other energy sources or storage mechanisms to provide a stable, consistent supply. There are no identified wind energy resources in the vicinity capable of providing a significant and consistent portion of the project energy. • Solar—Similar to wind, solar energy generation is intermittent and must be paired with other energy sources or storage mechanisms to provide a stable, consistent supply. Solar energy generation could not provide a consistent portion of the project energy. • ROR Hydropower—No suitable locations that could generate a significant amount of ROR hydropower could be identified. Additionally, in winter, rivers may freeze, making this power source intermittent, requiring additional energy sources. ***Why Eliminated—***These options would not provide a significant or consistent amount of energy. They are not reasonable or practicable options.	Eliminated from further analysis

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Power Source—Purchase Power from Existing Grid	POW-003	***Origination—***Purchasing power from the existing grid was evaluated by PLP when developing the project design. ***Description—***Under this option, power would be purchased from existing third-party providers and transmitted to the site via a High-Voltage Direct Current transmission. The nearest connection would be on the Kenai Peninsula, 120 miles from the mine site and across Cook Inlet. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: There is no significant power-generating capacity in the Cook Inlet area in general, and on the Kenai Peninsula in particular, to service the anticipated project demand. Even if there were some excess capacity, PLP would still need to construct additional generation capacity. Purchasing a portion of the necessary power from existing sources would require construction of more than 120 miles of high-voltage transmission line across Cook Inlet and overland. Power generation on the Kenai Peninsula is fueled by natural gas; and considering transmission line losses, this option would increase the consumption of natural gas compared to the proposed project. This option is not practicable. ***Why Eliminated—***The option is not practicable; there is no excess capacity in the existing grid.	Eliminated from further analysis
Power Source—Use Alternative Fuel Sources/ Delivery Methods	POW-004	***Origination—***Evaluation of alternative fuel sources and delivery methods was suggested during scoping due to concern with gas line leaks or ruptures, and potential long-term consequences that a subsea pipeline can have on the environment. ***Description—***The most likely alternative energy sources would be diesel fuel and LNG, both of which could be delivered to the proposed Amakdedori port via barge. Transportation from the port to the mine site could be by truck or pipeline.	Eliminated from further analysis

Table B-1: Project Options Considered

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		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Both diesel and LNG options are technologically feasible. The Donlin Gold Final EIS analyzed a diesel power plant alternative, and estimated that a similarly sized power plant (227 MW) would require approximately 80 million gallons of diesel per year. Use of diesel would require increased storage at the port, and a pipeline or 4,200 truck trips per year, each truck hauling 3 tank trailers. Diesel is readily available in Cook Inlet. The former ConocoPhillips LNG export facility in Nikiski has been sold, the export permit was allowed to expire, and LNG is not currently barged in Alaska. Using LNG would require a supply of LNG, a purpose-built LNG barge, and an LNG receiving terminal and storage tanks at Amakdedori. If the supply was in Alaska, it would require construction of an LNG compressor station, and likely a new export dock facility. It would also require regasification at Amakdedori for transportation to the mine site by pipeline, or trucking LNG to a mine site storage tank where it would be regasified and fed to the power plant. 3. Environmental Impacts Test: There would be few expected environmental impacts to soil or water from leaks from the proposed natural gas pipeline because the gas would dissipate rapidly (see Section 4.27, Spill Risk). Additionally, the pipeline would not have significant impacts to fish, crabs, shellfish, or marine invertebrates (see Section 4.24, Fish Values). Transporting an additional 80 million gallons of diesel requires additional footprint for storage tanks, and increases the potential for spills. Emissions from the power plant would be increased if diesel was used instead of natural gas. LNG would require additional footprint for a compressor station, storage tanks, regasification plant, and likely a new export dock. The additional footprints associated with diesel and LNG would increase impacts to wetlands and other waters. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	

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Power Plant Location—On-site	POW-005	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which includes construction of a new 270-MW power plant at the mine site to power the mine. This option would not require the construction of high-voltage transmission lines to the mine site. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Power Plant Location—Off-site with High-Voltage Transmission Lines	POW-006	***Origination—***Off-site location of the power plant was evaluated by PLP when developing the project design. ***Description—***This option would require a new power plant to be built at an alternative location such as the Kenai Peninsula or Amakdedori. High-voltage transmission lines would be constructed and used to transmit the power to the mine site. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: If power generation was on the Kenai Peninsula, it would require high-voltage transmission lines via underwater cables crossing both Cook Inlet and Iliamna Lake; and overhead lines on the Kenai Peninsula, from Amakdedori to a south ferry terminal, and the North Shore ferry terminal to the mine site. Underwater cables would be more costly to install and maintain than a natural gas pipeline. Overhead lines would be subject to wind and ice buildup, resulting in potential reliability risks. Undergrounding the overland portions of the transmission lines would be cost-prohibitive, because undergrounding generally costs an order of magnitude greater than overhead lines, and would be more costly than the gas line. In addition, transmission losses occur over long distances, making this less efficient than a gas line to provide on-site generation. If power generation was proximate to Amakdedori, similar issues would remain, but would be lessened, given the reduced distance. However, the gas line under Cook Inlet would still be required.	Eliminated from further analysis

Table B-1: Project Options Considered

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		In addition, off-site generation would not offer sufficient redundancy in the event of a disruption to the transmission line and associated power supply. This option is likely not practicable due to cost, but detailed cost information is not available to make the determination, so it was advanced to the next screening test. 3. Environmental Impacts Test: Construction and operation of high-voltage transmission lines would result in greater visual impacts than a gas line. Transmission losses would need to be overcome by producing additional power, which would increase consumption of natural gas and resulting emissions. ***Why Eliminated—***Off-site power production would result in increased visual impacts and consumption of natural gas and resulting emissions.	
Gas Source—Pipeline to a Source on the Kenai Peninsula	POW-007	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project. Under this option, the pipeline (about 192 miles in length) would tie in to the existing natural gas distribution system on the Kenai Peninsula and be routed to Amakdedori, and then follow the transportation corridor to the mine site. The pipeline would be on the bottom of Cook Inlet and Iliamna Lake, and would be 12 inches in diameter. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Gas Source—Pipeline to a Source on the West Side of Cook Inlet	POW-008	***Origination—***This option was evaluated by PLP when developing the project design. ***Description—***This option would follow an alternative route to the north to access existing natural gas supplies such as Beluga on the western side of Cook Inlet. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: There is no accessible gas infrastructure, pipeline capacity, or available tie-in locations on the southwestern side of Cook	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Inlet. A potential tie-in location on the western side would be at Beluga, approximately 170 miles to the north (requiring an approximately 250+ mile pipeline to accommodate terrain). 3. Environmental Impacts Test: Accessing existing gas supplies for this option would require crossing Lake Clark National Park; or if a subsea route, would increase the length of the pipeline route in critical habitat for the endangered Cook Inlet beluga whale and the threatened northern sea otter (compared to the proposed route). ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	
Gas Source—Connect to Donlin Gold Gas Pipeline	POW-009	***Origination—***Evaluation of an alternative pipeline route to connect with the natural gas pipeline for the proposed Donlin Gold Mine was suggested during scoping. ***Description—***Under this option, the pipeline would follow an alternative route to the north, allowing it to connect to the proposed Donlin Gold Mine natural gas supply pipeline. A tie-in route to the nearest point along the proposed Donlin Gold Mine pipeline would be at least 155 miles, and would cross at least 8 to 10 substantial rivers. Routing could avoid major mountain ranges. The proposed Donlin Gold Mine has not yet been constructed; timing for development and operation is not known. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The Donlin Gold pipeline has not been constructed and has not received all regulatory permits and approvals that would be necessary. Additionally, there is no indication that Donlin Gold LLC has begun final design or procurement of materials and contractors. This option is not available, and therefore not practicable. ***Why Eliminated—***The Donlin Gold pipeline does not exist, is not fully permitted or under construction, and is therefore not practicable.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Gas Source—Northern Gas Pipeline Route to Kenai Peninsula (Ursus Cove)	POW-010	***Origination—***Evaluation of a pipeline alignment north of Augustine Island was suggested during scoping due to concern that placing the pipeline near Augustine Island/Volcano would make it vulnerable to seismic and volcanic hazards. ***Description—***Increasing the distance from Augustine Island by routing to the north is impracticable for Amakdedori port, but routing the pipeline to Diamond Point to the north would achieve the purpose of the suggested option. Access option ACC-014 considers a port at Diamond Point in Iliamna Bay; routing the pipeline to this port would achieve the goal of increasing separation from Augustine Island. The pipeline for access option ACC-014 would be routed into Ursus Cove, run overland to Cottonwood Bay, and then continue to the Diamond Point port site. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This is a reasonable option for the North Access Route (ACC-002). The route to Ursus Cove is relatively free of seabed obstructions and rock-like features all the way into the cove, compared to a route through Iliamna Bay to a proposed Diamond Point port. Rocks, boulders, and boulder-type features in Ursus Cove only appear much closer to the shore, which makes routing and installation safer and easier, and also allows for moored installation. A route to Amakdedori north of Augustine Island would place the pipeline approximately the same distance or closer to Augustine Island/Volcano than the proposed route, and therefore is not a practicable route to achieve the goal of this option. Access Options ACC-014 and ACC-015 evaluate port sites in Iliamna Bay, more than 20 miles north of Augustine Island. It is feasible to route the natural gas pipeline to that location. 3. Environmental Impacts Test: A route to Ursus Cove and then to Diamond Point would have additional impacts from the overland portion, but would have a shorter segment in Cook Inlet. The option is carried forward for detailed analysis.	Included in Alternative 2 and Alternative 3

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Gas Source—Northern Gas Pipeline Route to Kenai Peninsula (Direct Route to Iliamna Bay)	POW-011	***Origination—***This option was evaluated by PLP as a conceptual route directly into Iliamna Bay and Diamond Point. ***Description—***Under this option, the pipeline route would follow a more direct route to Iliamna Bay and Diamond Point than POW-010. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: A 12-inch-diameter subsea pipeline has a specific minimum curvature radius, and therefore a limited ability to navigate areas of the seafloor with dense obstructions. A direct pipeline route into Iliamna Bay is not practicable because of boulders and rocky seabed near and into the bay that could not be avoided with this option. RFI 063 summarizes PLP's reconnaissance data for a direct route, which indicated the presence of—and progressive increase in—rocks, boulders, and rock-like features on the seabed (PLP 2018-RFI 063). The concentration of rocks and boulders reaches its maximum density at the mouth of Iliamna Bay, and continues into the bay. The rock-prone area starts approximately 13 miles from the landing point, and is consistent to the landing point. It is interpreted that the rocks and boulders are likely from a combination of glacial outwash and ice-rafted deposits. ***Why Eliminated—***This option is not practicable due to boulders and other seabed issues.	Eliminated from further analysis
Gas Source—Other	POW-012	***Origination—***Evaluation of practicable alternatives for reducing the amount of natural gas pipeline that is installed in the Sterling Highway ROW, which is managed by the ADOT&PF, was suggested during scoping. ***Description—***A scoping comment requested evaluation of alternative pipeline routes, but did not suggest specific locations. ***Why Eliminated—***PLP's project in the December 2017 DA permit application included a gas pipeline alignment that would connect to existing infrastructure near Happy	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Valley on the Kenai Peninsula and travel south, paralleling the Sterling Highway for 9 miles to a compressor station near Anchor Point. PLP's May 11, 2018 project description update changed the pipeline origin point to a compressor station north of Anchor Point, removing the requirement for the first 9 miles of pipeline construction along the Sterling Highway. Therefore, consideration of options for reducing the amount of natural gas pipeline installed in the Sterling Highway ROW are no longer applicable because the Sterling Highway is no longer a part of the proposed project.	
Gas Source—North Slope with New Pipeline	POW-013	***Origination—***Evaluation of an alternative to construct a pipeline from the North Slope to the proposed mine site was suggested during the public comment period of the DEIS. ***Description—***The alternative would use North Slope gas instead of Cook Inlet gas and construct a pipeline approximately 800 miles in length. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Construction of a natural gas pipeline from the North Slope to Southcentral Alaska has been pursued unsuccessfully for approximately 40 years. It is clearly not feasible for a single user to construct such a pipeline. ***Why Eliminated—***A natural gas pipeline constructed to serve the project is not feasible.	Eliminated from further analysis
Power Source—Geothermal	POW-014	***Origination—***Evaluation of an alternative to power the project using geothermal energy was suggested during the public comment period of the DEIS. ***Description—***Geothermal power would be produced from high temperature underground fluids or hot dry rock at or near Iliamna or Augustine volcanoes or other local underground heat sources. ***Screening—*** 1. Purpose and Need Test: Potentially meets the purpose and need in the long term, but not currently available.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		2. Reasonable and Practicable Test: Geothermal power could conceivably be produced in the region, and has been proven to be a consistent (baseload) power source in other volcanic settings, well in excess of 270 MW in some areas. However, the development of geothermal power would require several years of geophysical exploration and drilling to find and prove a resource, which may or may not be capable of producing 270 MW of power. If a resource is proven, additional years would be required to design and construct a power plant/s and install transmission lines. Exploration and construction costs would be extremely high due to the remote and roadless nature of the region. It is not economically feasible for a single user to conduct the extensive geothermal exploration that may or may not locate a power source, as well as construct an additional power plant/s and transmission lines. ***Why Eliminated—***A geothermal power source for the project is currently not proven, practicable, or available in a reasonable time frame.	
Gas Source—Anchor Point Connection	POW-015	***Origination—***Evaluation of an alternative entry point into Cook Inlet was suggested during the public comment period of the DEIS. ***Description—***The option would construct a pipeline in the Anchor Point area westerly along Seward Avenue from the existing gas line that feeds Homer along the Old Seward Highway. There is an existing gravel pad on the eastern side of the Old Sterling where the gas pressure station might be constructed. This option was the subject of RFI 120 (PLP 2019-RFI 120). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Construction of a natural gas pipeline following this alignment would increase the onshore length of pipeline by approximately 3 miles and the offshore Cook Inlet portion by 1 to 1.5 miles. An additional crossing of the Anchor River using horizontal directional drilling would be required. Capital costs are estimated to increase by $5 to 10 million.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		3. Environmental Impacts Test: There would be increased temporary impacts associated with the increased onshore construction footprint, impacts associated with the offshore section, and increased construction activity and associated disturbance in the Anchor Point area. There would be no apparent benefit. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	
Diesel Delivery—Pipeline from Port to Mine Site	POW-016	***Origination—***Evaluation of an alternative to deliver diesel via pipeline instead of trucking was suggested by a cooperating agency. ***Description—***A buried diesel pipeline would be constructed from either Amakdedori or Diamond Point to the mine site to eliminate trucking diesel. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Constructing a diesel pipeline is technically feasible and assumed to be economically feasible. However, constructing both a diesel pipeline and a natural gas pipeline would not likely be economically feasible; therefore, under this option, the Applicant would likely choose to fuel the power plant with diesel versus natural gas. This assessment is consistent with the Donlin Gold EIS, where Alternative 3B evaluated a diesel pipeline to reduce river barging of diesel, but USACE determined that building both a diesel pipeline and the proposed natural gas pipeline would be prohibitively expensive (USACE 2018d). 3. Environmental Impacts Test: Diesel pipelines can leak/rupture, and even small pinhole leaks can release large volumes over time because they can be difficult to detect using automated leak detection systems. The Donlin Gold EIS evaluated leaks from a similar-sized diesel pipeline and found potential spill volumes ranging from less than 99.9 gallons up to 790,020 gallons (this compares to the largest spill volume evaluated in this EIS of 3,000 gallons, the entire capacity of one diesel container). Alternative 1a and Alternative 1 would	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		require placing the diesel pipeline in Iliamna Lake, where leak detection and repair would be difficult, especially in winter; Alternatives 2 and 3 could avoid the lake placement. Because it is assumed that the power plant would be fueled with diesel instead of natural gas, this option would increase CO, NOx, SO_2, VOCs, PM, and other greenhouse gasses at the mine site. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	
Access Options			
Access Road—South Access Route (Road and Ferry)	ACC-001	***Origination—***This was PLP's original proposed project. ***Description—***This road and ferry route option is part of the project, which includes the construction of two double-lane roads as the main access route to the mine for the transportation of materials, equipment, and concentrate. Road route: The mine access road would go from the mine site to the North Shore ferry terminal site (ACC-006) on the northern shore of Iliamna Lake. An alternative ferry terminal site location to the east of the proposed ferry terminal site in the bay (North Shore East ferry terminal site) is considered as option ACC-006a. On the southern shore of Iliamna Lake, the port access road would go from the Kokhanok west ferry terminal site (ACC-010) to the Amakdedori port site (ACC-013). Amakdedori cannot accommodate deep-draft vessels, and would require lightering barges to transfer ore concentrate to deep-draft bulk ships anchored at mooring locations. As a variant of the project, the port access road would go from the Kokhanok east ferry terminal site (ACC-011) to the Amakdedori port site (ACC-013). This option would also include an Iliamna spur road (which would include a crossing of the Newhalen River) and a Kokhanok spur road (which would include a crossing of the Gibraltar River if the Kokhanok west ferry terminal site is included). Ferry route: The route would include a ferry crossing of Iliamna Lake from north to south.	Included in Alternative 1a and Alternative 1

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Natural gas pipeline route: The Alternative 1a natural gas pipeline would follow the port access road to Iliamna Lake, cross to a landfall near Newhalen/Iliamna, and join the mine access road at the Newhalen River crossing. The Alternative 1 natural gas pipeline would follow the mine and port access roads and ferry route. This option would require the following: Total miles of road: 78 (Alternative 1a); 77 (Alternative 1); 70 (Kokhanok East Ferry Terminal Variant) Total number of major river crossings: 2 (Alternative 1a and Alternative 1 [Kokhanok west ferry terminal site to Amakdedori port site]); 1 (Alternative 1—Kokhanok East Ferry Terminal Variant [Kokhanok east ferry terminal site to Amakdedori port site]). ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	
Access Road—North Access Route (Road Only)	ACC-002	***Origination—***Evaluation of an access road option north of Iliamna Lake to eliminate the need for a lake crossing was suggested during scoping. ***Description—***This road-only route option was evaluated by PLP when developing the project design as an option that would not require a ferry to cross Iliamna Lake. Road route: The mine/port access road would stay north of Iliamna Lake, connect with the existing Williamsport-Pile Bay Road in the vicinity of Pile Bay, and then continue to the Diamond Point/Iliamna Bay port site (ACC-014) on Cook Inlet. The road would parallel or replace portions of the existing Williamsport-Pile Bay Road and intersect with the existing Iliamna/Newhalen road network, eliminating the need for a spur road to Iliamna. The road would traverse approximately 1 to 2 miles of tidal flats between Williamsport and Diamond Point. Ferry route: The route would not include use of a ferry. Natural gas pipeline route: The western portion of the natural gas pipeline would follow the road route. The eastern portion of the pipeline would follow a route overland between Cottonwood Bay and Ursus Cove.	Included in Alternative 3

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Concentrate pipeline: A concentrate transport pipeline may be included with this option. This option would require the following: Total miles of road: 83 Number of major river crossings: 4 ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This is a route that PLP has evaluated and studied extensively. A road-only route provides the advantages of reliable year-round access, and minimizes the need to re-handle cargo/concentrates. The option may also allow the inclusion of a concentrate pipeline for the project. There is no need to build the associated infrastructure for a ferry. This option would provide access to Cook Inlet, which is generally accessible year-round. This option would require a large number of stream crossings. This option also crosses many wetlands. The route is also more mountainous than other access routes, traversing side slopes and crossing perpendicular to drainages, including crossings of larger streams and minor rivers. The Diamond Point/Iliamna Bay port site (ACC-014) and access road would be subject to tidal flat filling. The port would require dredging to 15 to 20 feet of MLLW (PLP 2018-RFI 063), and may require blasting for access roads. This location could not accommodate deep-draft vessels, and would require lightering barges to transfer ore concentrate to deep-draft bulk ships anchored at mooring locations. Diamond Point appears to be a practicable port location. 3. Environmental Impacts Test: This route would cross fewer wetland acres than a southern route (ACC-001), but more than a road and ferry northern route (ACC-003), resulting in a difference in acres of fill. The Iliamna spur road would be eliminated, reducing impacts along these road miles. The road portion from Pile Bay to Williamsport would require more maintenance	

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		compared to a southern route (ACC-001), given the steep terrain. This route would require more stream crossings than a southern route (ACC-001) or a road and ferry northern route (ACC-003). There would be no lake navigation or transportation concerns compared to a road and ferry route (ACC-001 or ACC-003). The route would place mine traffic near Pedro Bay. The option represents trade-offs, and is carried forward for detailed analysis. If a concentrate pipeline was also included (CTR-002), the footprint would be slightly larger, but there would be a decrease in truck traffic.	
Access Road—North Access (Road and Ferry)	ACC-003	***Origination—***This road and ferry route option is a route evaluated by PLP while looking at routes that remain entirely north of Iliamna Lake. Use of the existing road and resources at Pile Bay and Williamsport was suggested during scoping. ***Description—*** Road route: The mine access road would stay north of Iliamna Lake from the mine site to the Eagle Bay ferry terminal site (ACC-008) on the northern shore of Iliamna Lake. On the eastern shore of Iliamna Lake, the port access road would go from the Pile Bay ferry terminal site (ACC-009) to the Diamond Point/Iliamna Bay port site, using parts of the existing Williamsport-Pile Bay Road, continuing to the Diamond Point/Iliamna Bay port site (ACC-014) on Cook Inlet. This road would bypass all but 5 miles of the existing Williamsport-Pile Bay Road. The road would traverse approximately 1.7 miles of tidal flats between Williamsport and Diamond Point. This option would eliminate the need for a spur road to Iliamna, because the route would cross an existing road that connects Iliamna with Nondalton, providing access to infrastructure at Iliamna. Ferry route: The route would include a ferry crossing of Iliamna Lake from west to east. Natural Gas Pipeline route: The natural gas pipeline would follow the road alignment for ACC-002 because Iliamna Lake is too deep on the eastern side of the lake for laying the pipeline on the bottom (the steep underwater cliffs would stress the pipeline	Included in Alternative 2. Alternative 1a would use the mine access road portion of this option north of Iliamna Lake.

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		bends). The eastern portion of the pipeline would follow a route overland between Cottonwood Bay and Ursus Cove. This route was proposed as an option by PLP. This option would require the following: Total miles of road: 54 Number of major river crossings: 1 ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Thicker lake ice on the eastern side of the lake would make ferry operation more challenging; however, feasibility has been demonstrated by the long-term operation of an ice-breaking ferry on Williston Lake in British Columbia. Water depth and lakebed topography may preclude the use of a sub-lake gas pipeline along this alignment. The existing Williamsport-Pile Bay Road would require improvements to accommodate large trucks. The road and ferry route appear practicable. The Diamond Point/Iliamna Bay port site (ACC-014) and access road would be subject to tidal flat filling. The port would require dredging to 20 feet of MLLW (per PLP 2018-RFI 063), and may require blasting for access roads. This location could not accommodate deep-draft vessels, and would require lightering barges to transfer ore concentrate to deep-draft bulk ships anchored at mooring locations, similar to the proposed project. Diamond Point appears to be a practicable port location. 3. Environmental Impacts Test: This route would cross fewer wetland acres than a southern route (ACC-001) or an all-road northern route (ACC-002), resulting in fewer acres of fill. An Iliamna spur road would be eliminated, reducing impacts along these road miles. The road portion from Pile Bay to Williamsport would require more maintenance compared to a southern route (ACC-001), given the steep terrain. The addition of a ferry route would require construction of two ferry terminals, resulting in placement of fill, and also resulting in greater	

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		transportation and potential navigation concerns along the ferry route in the eastern portion of the lake. There would be subsistence concerns with the ferry route being in areas important for subsistence seal harvesting. The route would place mine traffic near local communities, including Iliamna, Nondalton, Pedro Bay, and Pile Bay.The option represents trade-offs, and is carried forward for detailed analysis.	
Access Road—West Access Route	ACC-004	***Origination—***This road option is a road-only access route evaluated by PLP when developing the project design as an option that would not require a ferry to cross Iliamna Lake. ***Description—*** Road route: The road would go from the mine site around the western end of Iliamna Lake and continue to the Amakdedori port site on Cook Inlet. This option would also include an Iliamna spur road. Ferry route: This option would not require a ferry. Natural gas pipeline route: The natural gas pipeline would likely follow the road. Concentrate pipeline: A concentrate transport pipeline may be included with this option. This option would require the following: Total miles of road: 160 Total number of major river crossings: 4 ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: A road-only route provides the advantages of reliable year-round access, and minimizes the need to re-handle cargo/	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		concentrates. The option would also allow the inclusion of a concentrate pipeline for the project. There is no need to build the associated infrastructure for a ferry. This option would provide access to Cook Inlet, which is generally accessible year-round. This option has a longer road footprint, with more wetlands and streams crossed. 3. Environmental Impacts Test: This access route has the highest occurrence of wetlands, with the highest environmental impact to wetlands. If a concentrate pipeline were also included, the footprint would be slightly larger. ***Why Eliminated***—This option would not be less environmentally damaging than the Applicant's proposal.	
Access Road—Bristol Bay Access Route (Road Only)	ACC-005	***Origination—***Evaluation of alternative port sites was suggested during scoping due to concerns with the potential ecological impact of the project. ***Description—***This road option is a road-only access route that was evaluated by PLP when developing the project design as an option that used port sites other than Cook Inlet. Road route: The road would go from the mine site to a port site on Bristol Bay. Ferry route: This option would not require a ferry. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This transportation corridor would require twice as much road construction as the proposed project. The route is wetter and would cross more rivers and streams. Because Bristol Bay is shallow, a long trestle or causeway into the bay would be required to accommodate the lightering barges. Additionally, Bristol Bay is ice-bound for a larger portion of the year than lower Cook Inlet.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		3. Environmental Impacts Test: This option would traverse mainly lowlands, require large structures below the high-tide line, and have more impact to wetlands and other waters than the proposed project. ***Why Eliminated*—**This option would not be less environmentally damaging than the Applicant's proposal.	
Ferry Terminal Location—North Shore Ferry Terminal	ACC-006	***Origination*—**This is PLP's proposed project. ***Description*—**This ferry terminal site option is part of the project, which includes the construction of a ferry terminal on the northern shore of Iliamna Lake for an ice-breaking ferry to transport materials, equipment, and concentrate across the lake. The ferry route would be north-south. This location is associated with the South Access Route (Road and Ferry): ACC-001. As a variant to this option, an additional site slightly to the east in the same bay as the North Shore ferry terminal is included: the North Shore east ferry terminal site variant. This option would include the following: Number of ferry miles to Kokhanok west ferry terminal site (ACC-010): 19 Number of ferry miles to Kokhanok east ferry terminal site (Kokhanok East Ferry Terminal Variant) (ACC-011): 25 ***Screening*—**Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in Alternative 1
Ferry Terminal Location—North Shore East Ferry Terminal	ACC-006a	***Origination*—**Evaluation of this ferry terminal location was suggested during scoping as potentially affording more shelter from eastern winds. ***Description*—**This ferry terminal site option would include the construction of a ferry terminal on the northern shore of Iliamna Lake for an ice-breaking ferry to transport materials, equipment, and concentrate across the lake. The ferry route would be north-south. This location would be associated with the South Access Route (Road and Ferry): ACC-001. The site is approximately 3.5 miles east of the North Shore ferry terminal site (ACC-006) in the same bay, and would require a realignment of the	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		proposed road to the mine site. This option is evaluated in RFIs 074 and 079 (PLP 2018-RFI 074, PLP 2018-RFI 079). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option would increase the length of the road between the mine site and north shore ferry terminal. The option may provide a marginal improvement in protection from eastern winds compared to the proposed location, which could allow PLP to operate the ferry in higher winds. The option is practicable. 3. Environmental Impacts Test: This option increases impacts to wetlands and other waters when compared to the proposed location because the road would need to cross additional streams and wetlands. Additionally, the road would be much closer to areas identified by the landowner (Alaska Peninsula Corporation) as important subsistence and recreational use areas. Spill potential would be similar to the proposed location, considering that the ferry would not operate when conditions are not safe. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	
Ferry Terminal Location—Iliamna and Kokhanok Ferry Terminals	ACC-007	***Origination—***Evaluation of ferry terminals closer to existing infrastructure was suggested during scoping to reduce impacts to Gibraltar River and UTC. ***Description—***Under this option, a north shore ferry terminal would be located in or near the communities of Newhalen and Iliamna, but away from the Newhalen River. The Iliamna spur road would therefore be the main mine access road route to connect the mine site to this ferry terminal. This option location could be included with South Access Route (Road and Ferry): ACC-001. A south shore ferry terminal would be located north of the Kokhanok Airport. The road from this ferry terminal to Amakdedori port would follow a route similar to that described under ACC-001 for the Kokhanok East Ferry Terminal Variant to avoid	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		crossing the Gibraltar River. The ferry route would be north-south, and approximately 21 miles. This option location could be included with South Access Route (Road and Ferry): ACC-001. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: It appears feasible to build a ferry terminal in this location, but shallow water depth may require dredging. 3. Environmental Impacts Test: The ferry traffic would impact current vessel and floatplane use, and heavy mine trucks traversing through the communities would create noise, dust, and congestion. This location is closer to high-use areas for subsistence fishing and seal harvesting. Dredging would have impacts to water quality and aquatic resources. ***Why Eliminated—***This option would increase overall adverse impacts.	
Ferry Terminal Location—Eagle Bay Ferry Terminal	ACC-008	***Origination—***This ferry terminal option was evaluated by PLP when developing the proposed design as an alternative north shore ferry terminal location suitable for either a north-south lake transit or an east-west transit. ***Description—***Under this option, a north shore ferry terminal would be located in Eagle Bay. A road would connect the mine site to the terminal. A spur road to Iliamna would not be included in this option because the mine access road would cross the existing road from Iliamna to Nondalton, and provide community access. This option location is associated with the North Access Route (Road and Ferry): ACC-003. The location could be included with South Access Route (Road and Ferry): ACC-001. This option would include the following: Number of miles to Pile Bay ferry terminal site (ACC-009) (Alternative 2): 29 Number of ferry miles to Kokhanok ferry terminal site (ACC-010) (Alternative 1a): 28	Included in Alternative 1a and Alternative 2

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This location is sheltered for ferry operations and protected from prevailing winds. There may be navigability issues associated with the water depth in the area. Ice in the bays is thicker and more persistent than in the open lake west of Newhalen. This option minimizes the road footprint in the UTC drainage. 3. Environmental Impacts Test: This option represents trade-offs from the shorter road and longer ferry route, and is carried forward for analysis as an alternative in the EIS.	
Ferry Terminal Location—Pile Bay Ferry Terminal	ACC-009	***Origination—***This ferry terminal option was evaluated by PLP when developing the project design. ***Description—***This option considers an eastern shore ferry terminal location suitable for use with a northern access route, and the Eagle Bay ferry terminal as a western ferry terminal site. This option location is associated with the North Access Route (Road and Ferry): ACC-003. This option would include the following: Number of ferry miles to Eagle Bay ferry terminal site (ACC-008): 33 ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This location is practicable. 3. Environmental Impacts Test: This option represents trade-offs from the shorter road and longer ferry route, and is carried forward for analysis as an alternative in the EIS.	Included in Alternative 2

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Ferry Terminal Location—Kokhanok West Ferry Terminal	ACC-010	***Origination—***This is PLP's proposed project. ***Description—***This ferry terminal option is part of the project, which includes the construction of a ferry terminal on the southern shore of Iliamna Lake for an ice-breaking ferry to transport materials, equipment, and concentrate across the lake to a port site on Cook Inlet. The ferry route would be north-south. The south ferry terminal would be at the Kokhanok west ferry terminal site, approximately 5 miles west of Kokhanok. This option would include a Kokhanok spur road. This option is associated with the South Access Route (Road and Ferry): ACC-001. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in Alternative 1a and Alternative 1
Ferry Terminal Location—Kokhanok East Ferry Terminal	ACC-011	***Origination—***Evaluation of alternative ferry terminal locations was suggested during scoping. ***Description—***This ferry terminal option was evaluated as a variant of the project for an alternative southern shore ferry terminal location. The south ferry terminal would be approximately 5 miles east of the community of Kokhanok at the Kokhanok east ferry terminal site. This option would include a Kokhanok spur road. This option is associated as a variant of the South Access Route (Road and Ferry): ACC-001. The port access road would follow a shorter route (6 miles shorter) than from ACC-010 to the Amakdedori port site, and would not require a crossing of the Gibraltar River. This option is evaluated in RFI 078 (PLP 2018-RFI 078). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The location is sheltered, would require a shorter access road, a longer ferry crossing, and avoid crossing of the Gibraltar River. It appears practicable. 3. Environmental Impacts Test: This option appears to reduce impacts to wetlands and other waters, the Gibraltar River, and visual resources, but may impact snowmachine travel. This option represents impact trade-offs, and is carried forward for analysis as a variant of the project.	Included in Alternative 1 (Kokhanok East Ferry Terminal Variant)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Ferry Terminal Location—Use Alternative Ferry Terminal Sites	ACC-012	***Origination—***Evaluation of alternative ferry terminal locations was suggested during scoping. ***Description—***The suggested option requested consideration of alternative ferry sites and locations compared to the proposed project, but did not specify locations. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable Test: The ferry terminal options described in this table are the most feasible locations, and cover a variety of logistical and environmental considerations. This option is not reasonable to carry forward because other substantially similar—but more specific—locations are being considered, meeting the intent of the scoping comment. ***Why Eliminated—***Several ferry terminal location options were developed and incorporated into this table. This option is not reasonable to carry forward because other substantially similar—but more specific—locations are being considered, meeting the intent of the scoping comment.	Eliminated from further analysis
Port Location—Amakdedori Port Site	ACC-013	***Origination—***This is PLP's proposed project. ***Description—***This port site option is part of the project, which includes the construction of a port on Cook Inlet to transfer diesel fuel, materials, equipment, and concentrate using barges. The dock structure would extend to 15 feet of water depth, and dredging would not be required. The port location would be at Amakdedori. This option is associated with the South Access Route option (Road and Ferry): ACC-001. This port site would use the Offshore Lightering—Amakdedori option (ACC-022). ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in Alternative 1a and Alternative 1

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Port Location—Diamond Point/Iliamna Bay Port Site	ACC-014	***Origination—***Evaluation of an option for a port site at Diamond Point in Iliamna Bay was suggested during scoping. ***Description—***This port site option was examined by PLP in the process of developing the proposed project. The port site would be at Diamond Point in Iliamna Bay. This port site option is associated with the North Access Routes (ACC-002 and ACC-003). This port site would use the Offshore Lightering-Iniskin option (ACC-023). The approach to Diamond Point would require a dredged channel for barges and tugs to access the loading dock. The design vessels would require dredging to a depth of -15 to 20 feet MLLW (per PLP 2018-RFI 063 and PLP 2020d). The dredged channel would be prone to sedimentation, and require frequent maintenance dredging; therefore, greater under-keel clearance is recommended compared to the depth of 15 feet MLLW described at the Amakdedori port site (ACC-013). Dredged material would either be used in construction of the causeway and dock, or disposed of onshore. The total volume of dredged material is estimated to be 650,000 to 1.1 million cubic yards, some of which would be used in the barge dock construction. Any rocks encountered in the channel would be moved to the side of the channel, or used in the dock construction. Any remaining dredged material and any material from maintenance dredging would be disposed of onshore in a bermed facility on uplands. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The Diamond Point location is somewhat sheltered, and access for this option could use portions of the existing Williamsport-Pile Bay Road. The port site and access road include construction and placement of fill in the intertidal zone in Iliamna Bay. The port would require initial and maintenance dredging and blasting for access roads. This location could not accommodate deep-draft vessels, and would require	Included in Alternative 2 and Alternative 3

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		lightering barges to transfer ore concentrate to deep-draft bulk ships anchored at mooring locations. 3. Environmental Impacts Test: This option would use some areas already impacted by development (Williamsport-Pile Bay Road and Diamond Point Rock Quarry), and may avoid bear-migration areas. Dredge and fill impacts would be greater in the intertidal zone.	
Port Location—Knoll Head/ Iniskin Bay Port Site	ACC-015	***Origination—***This port site option was examined by PLP in the process of developing the project design. ***Description—***This port site would be at Knoll Head in Iniskin Bay, and is associated with the North Access Routes (ACC-002 and ACC-003). This port site would use the Offshore Lightering-Iniskin option (ACC-023). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option requires challenging access and port site construction, and would require significant costly earthwork. 3. Environmental Impacts Test: Access to this port would require crossing Iliamna Bay via a causeway, and includes placement of fill in the intertidal zones in both Iliamna Bay and Iniskin Bay. ***Why Eliminated—***The environmental impacts would be greater than the proposed project (and ACC-014—Diamond Point).	Eliminated from further analysis
Port Location—Fortification Bluff/Rocky Point Port Site	ACC-016	***Origination—***This port site option was examined by PLP in the process of developing the project design. ***Description—***Under this option, the port location would be at Fortification Bluff/Rocky Point, which is approximately 15 miles north of Amakdedori, and would require 26 additional road miles from the port access road route to this port site, compared to the proposed project (ACC-001).	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		This option is associated with the South Access Route option (Road and Ferry): ACC-001. The natural gas pipeline would not be co-located along the road, and would be routed through Amakdedori, as described in ACC-001. This port site would use the Offshore Lightering—Amakdedori option (ACC-022). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option requires a longer access road and more challenging port site construction than other options, which would increase the total amount of road construction for the project. Shore approach routing options for the gas pipeline are not available due to the proximity to Augustine volcano. This option has a requirement for a steep access road to the shore that poses operational safety challenges. This option is therefore not practicable. ***Why Eliminated—***This option would construct a road through steep terrain and result in unsafe grades, and is not practicable.	
Port Location—Williamsport Port Site	ACC-017	***Origination—***Use of the existing road and resources at Pile Bay and Williamsport was suggested during scoping. ***Description—***This port site option was examined by PLP in the process of developing the project design. The port location would be at the existing Williamsport location in Iliamna Bay. This port site option would be included with the North Access routes (ACC-002 and ACC-003), and may include the Eagle Bay ferry terminal site (ACC-008) and Pile Bay ferry terminal site (ACC-009) options. This option would require improvements to the existing port facilities. This option would require initial dredging of 4.2 million cubic yards from 147 acres of seafloor. The frequency and amount of maintenance dredging has not been determined; but given the extensive mudflats in the area, they are expected to be substantial.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		This port site would use the Offshore Lightering-Iniskin option (ACC-023). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Williamsport is inaccessible by sea, except for brief periods at the peak of extreme high tides, which occur a few days each month (USACE 1995). A 1995 Environmental Assessment by USACE (USACE 1995) indicates that a considerable amount of initial and ongoing maintenance dredging would be required to accommodate barges between the mouth of Iliamna Bay and Williamsport. The existing sea bottom is 2 or 3 feet above MLLW near the landing, and it would be necessary to dredge 22 to 23 feet of material. The dredged area would be approximately 147 acres, and an estimated 4.2 million cubic yards would need to be dredged initially to obtain the necessary depth of -20 feet MLLW. The dredged channel would be prone to sedimentation, and require frequent maintenance dredging. The dredged material would need either onshore or offshore disposal. Existing uses of Williamsport may not be compatible with the level of activity proposed by PLP. Although this option appears to be not practicable, a conclusive determination has not been made, and it was advanced to the next screening criteria. 3. Environmental Impacts Test: This option would have increased adverse environmental impacts from the dredging and disposal of the dredged material, compared to the proposed project (ACC-013). ***Why Eliminated—***This option would increase overall adverse impacts.	
Port Location—Utilize Alternative Port Sites	ACC-018	***Origination—***Using alternative port sites was suggested during the scoping period. ***Description—***A scoping comment requested consideration of alternative port sites and locations, but did not suggest specific locations. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		2. Reasonable and Practicable Test: The five port site options described in this table are the most feasible locations, and cover a variety of logistical and environmental considerations. The suggested option is not reasonable because it is not specific; however, the intent of the suggestion is fulfilled through evaluation of ACC-013 through ACC-017. ***Why Eliminated—***Several port site options were considered (see ACC-013 through ACC-017). This non-specific option is not a reasonable option, and can therefore be eliminated in favor of the five location-specific options.	
Dock Type—Fill Dock	ACC-019	***Origination—***This was PLP's original proposed project. ***Description—***PLP has proposed to construct a fill dock and sheet pile bulkhead at the port location. ***Screening—***Because this option is included in the project, it is presumed to meet the screening criteria for purposes of detailed environmental review.	Included in Alternative 1 and Alternative 2
Dock Type—Pile-Supported Dock	ACC-020	***Origination—***The USACE is evaluating an option for a pile-supported dock to satisfy requirements for minimization of impacts to wetlands and other waters. ***Description—***This option would construct a pile-supported dock rather than a fill dock at the port sites under evaluation. This option is evaluated in RFI 072 (PLP 2018 RFI-072). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Many docks are pile-supported, and USACE typically requires their evaluation. Pile-supported docks can be built at the port locations, but would likely be more expensive. The option appears practicable. 3. Environmental Impacts Test: Pile-supported docks would require less fill in wetlands and other waters, and reduce impacts to circulation and potentially fish migration. This option will be evaluated as a variant of the project and for a Diamond Point port site.	Included in Alternative 1 (Pile-Supported Dock Variant) and Alternative 2 (Pile-Supported Dock Variant)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Port Operations—Shore-Side Loading	ACC-021	***Origination—***Shore-side loading was evaluated by PLP when developing the project design. ***Description—***This type of loading was originally proposed as an option by PLP when developing the project, but was eliminated in PLP's project design updates in May 2018. Bulk carriers would be loaded directly at the port site (rather than at lightering locations), and would require a deep-draft navigation channel and turning basin of approximately 50 feet of water depth. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This was PLP's original proposed project, so is assumed to be economically and technologically feasible. This option involves loading a bulk carrier directly at the dock side, which minimizes concentrate re-handling and leads to improved safety and reliability. All locations where this could take place require dredging or causeway construction to allow for shore-side loading of bulk carriers. It is estimated that initially, 10 million cubic yards would need to be dredged, and another 10 million cubic yards may need to be dredged over the life of the mine to maintain the design depth. Dredging operations for this option would increase impacts to wetlands and other waters, and requires the placement of dredge spoils. 3. Environmental Impacts Test: Dredging would have environmental impacts to marine habitat and shoreside habitat where dredged material would be placed; dredging would result in a higher volume of fill compared with other loading options such as lightering; and maintaining the deep-draft navigation channel and turning basin would require annual maintenance dredging that would be a long-term effect. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Port Operations—Offshore Lightering—Amakdedori	ACC-022	***Origination—***This was PLP's original proposed project. ***Description—***The lightering option is included in the project, and requires approximately 15 feet of water depth at the dock, which would be achieved at Amakdedori without dredging by extending the dock to the required water depth. The primary lightering location is approximately 12 miles offshore east of the Amakdedori port; an alternate lightering location is approximately 18 miles east-northeast of the port between Augustine Island and the mainland. Wave heights in this area are reduced by Augustine Island, and it would be used when required by sea conditions. ***Screening—***Because this option is included in the project, it is presumed to meet the screening criteria for purposes of detailed environmental review.	Included in Alternative 1a and Alternative 1
Port Operations—Offshore Lightering—Iniskin	ACC-023	***Origination—***The Iniskin Bay lightering option was developed as an alternative by PLP when looking at alternative port sites such as Diamond Point/Iliamna Bay (ACC-014). ***Description—***Under this option, concentrate would be transported using lightering barges to bulk carriers moored in Iniskin Bay. An alternate lightering location approximately 18 miles east-northeast of the port between Augustine Island and the mainland would be used when required by sea conditions (Alternative 2). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The Iniskin Bay option has adequate water depth for the bulk carrier ships and affords good protection; it is a practicable option similar to ACC-022. 3. Environmental Impacts Test: This option would have less environmental impact to the marine environment than a large dock facility. There would be less dredging and placement of fill required.	Included in Alternative 2 and Alternative 3

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Other Access Options—Mandatory Bridges at Stream Crossings	ACC-024	***Origination—***An option to require bridges at all anadromous stream crossings was suggested during scoping. ***Description—***This option would make it mandatory for bridges to be built any time the access route crosses a stream or river that supports anadromous fish. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Not reasonable, because the ADF&G would specify the crossing requirements necessary to protect anadromous fish, which may be achieved by other means such as culverts rather than bridges. ***Why Eliminated—***This option is not reasonable. Other forms of stream crossings such as culverts are often appropriate structures. The design and permitting process would select appropriate crossing structures to address the environmental concerns and reduce impacts.	Eliminated from further analysis
Other Access Options—Revised Project Alignment via Micro-Siting	ACC-025	***Origination—***Consideration of micro-siting practices for the access roads was evaluated by the USACE as a potential means to avoid environmental impacts. ***Description—***Develop an alternative that uses micro-siting practices for all project components to avoid impacts to wetlands, stream crossings, guiding, lodges, wildlife, visual resources, archeological, and historical resources. Avoid or minimize, or stay outside buffer areas important to resources. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This is not a reasonable option because it lacks specificity, and is essentially mitigation. Micro-siting practices would be demonstrated by the Applicant when it documents the steps and measures it has taken to avoid and minimize environmental impacts of its proposed project. Mitigation measures included in PLP's design, which are integral components of the project, are included in Chapter 5, Mitigation, and are	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		considered in the impact analysis in the EIS for the project and applicable components of other action alternatives. ***Why Eliminated—***This option is not reasonable. Dismissal of this option would not preclude future consideration of micro-siting as mitigation to avoid or minimize specific impacts identified through the NEPA impact analysis, or as required by resource agencies during project permitting as the project design and permitting advances.	
Other Access Options—Summer-Only Ferry Operations	ACC-026	***Origination—***An option to restrict ferry options to the open-water season was suggested during scoping. This option is evaluated in RFI 065 (PLP 2018-RFI 065). ***Description—***A ferry would only be allowed to operate in the open water season when no ice-breaking is necessary, for approximately 6 months of the year. Concentrate would be stored in a container-based system that would be stockpiled at the mine site to avoid additional handling steps in loading the concentrate, and the associated potential for emissions. The containers would be stored in a laydown area at the mine site. There would also be a laydown area at the Amakdedori port site, or along the Williamsport-Pile Bay Road for the Diamond Point port site. There would be additional logistical considerations associated with ceasing ferry operations during lake-ice conditions, such as an increase in truck traffic during the operations period. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: RFI 065 (PLP 2018-RFI 065) shows that the option to store concentrate in the winter for summer shipment can be done, but would increase costs. It is not possible to determine if the increased costs would be substantial enough to affect the economic viability of the overall project. The option is assumed to be practicable. 3. Environmental Impacts Test: This option would decrease winter impacts from trucking and ferry operations, but would essentially double the truck and ferry traffic in the ice-free months.	Included in Alternative 1 (Summer-Only Ferry Operations Variant) and Alternative 2 (Summer-Only Ferry Operations Variant)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Other Access Options—Diesel Pipeline and Iniskin Bay Port	ACC-027	***Origination—***An option to evaluate an alternative or variant that includes the infrastructure elements that would be anticipated under the Pebble Project expansion scenario (i.e., diesel pipeline, port site at Iniskin Bay) was suggested during the public comment period of the DEIS. This would enable consideration of options that would avoid or minimize cumulative impacts that would occur as result of redundant infrastructure associated with expanded development. ***Description—***The expanded mine development scenario includes continued use of either Amakdedori or Diamond Point ports to transport containerized freight, and a port facility in Iniskin Bay to load concentrate (delivered to Iniskin by slurry pipeline) and unload diesel fuel (delivered to the mine site by pipeline). The Iniskin Bay port facility would be accessed by road, but the road would not be designed for tractor-trailer rigs capable of hauling containerized freight because the terrain is steep, and meeting the necessary grade and curvature constraints would be difficult (see also ACC-015, which evaluates Iniskin Bay for a port for containerized freight, diesel, and concentrate). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: An option to develop a port in Iniskin Bay capable of transferring containerized freight is evaluated under option ACC-015 and dismissed. The option suggested here would add an Iniskin Port to Alternative 1, Alternative 2, or Alternative 3 to handle only copper/gold concentrate and diesel fuel. This option allows construction of a steeper road with tighter curvature because heavy trucks loaded with freight, diesel fuel, and concentrates would not need to operate on the road. 3. Environmental Impacts Test: This option would increase the environmental impacts by adding a road and port facility that are not necessary for the project. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Dock Type—Caisson Dock	ACC-028	***Origination—***Developed by PLP to avoid and minimize impacts described in the DEIS. ***Description—***The caisson design concept places pre-cast concrete boxes (or caissons) (60 feet by 60 feet and 120 feet by 60 feet) on the seabed as supports for the causeway and dock. Pre-cast bridge beams are the placed on the caissons and topped with a concrete deck for the final dock surface. This option is described in PLP (2019b, PLP 2020d). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The caisson dock appears to be well suited for the shallow bedrock in the Amakdedori area, more durable, and cost effective. The option appears practicable. 3. Environmental Impacts Test: The option would decrease impacts associated with the solid fill dock and represent tradeoffs when compared to the pile-supported dock variant.	Included in Alternative 1a and Alternative 3
Newhalen River Crossing—North Crossing	ACC-029	***Origination—***Developed by PLP and was the DEIS Alternative 2 and Alternative 3 Newhalen River crossing location. ***Description—***The crossing would be a five-span bridge. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The crossing is feasible and comparable in curvature and grade to ACC-030. 3. Environmental Impacts Test: It appears this crossing would impact cultural artifacts, but otherwise would be similar in impacts to the South Crossing.	Included in Alternative 2 (Newhalen River North Crossing Variant)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Newhalen River Crossing—South Crossing	ACC-030	***Origination—***Developed by PLP to avoid cultural artifacts at the Newhalen River North Crossing location. ***Description—***The crossing would be a five-span bridge, roughly 1 mile downstream from ACC-029. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The crossing is feasible and comparable in curvature and grade to ACC-029. 3. Environmental Impacts Test: It appears this crossing would not impact cultural artifacts, but otherwise would be similar in impacts to the North Crossing.	Included in Alternative 1a, Alternative 2, and Alternative 3
Concentrate Transport Options			
Concentrate Transport—Truck	CTR-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which involves containerized transport of ore concentrate by using the road and ferry access route (South Access Route [Road and Ferry]: ACC-001). This option would use trucks to carry concentrate containers from the mine site. Concentrate would be transported to the port location, loaded onto a ferry, and re-handled at lightering locations. This option does not allow for the inclusion of a concentrate pipeline. This option may also be included with the North Option Route (Road and Ferry): ACC-003. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Concentrate Transport—Pipeline	CTR-002	***Origination—***Evaluation of an option for an ore concentrate pipeline was suggested during scoping due to concerns with ferrying ore concentrate across Iliamna Lake. ***Description—***This option would transport the copper/gold concentrate to the port site as a slurry in a single, approximately 6.25-inch-diameter steel pipeline (PLP 2018-RFI 066). The molybdenum concentrate would still be transported by truck, as proposed under the project. The concentrate pipeline and the gas pipeline	Included in Alternative 3 (Concentrate Pipeline Variant)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		would be co-located in a single trench at the toe of the road embankment, which would increase the average width of the road corridor footprint by 3 to 5 feet. Pump stations would be required to move concentrate through the pipeline. This option would require a WTP and a discharge permit at the port site, and would result in a small reduction (<1 cubic foot per second) in water available for discharge at the mine site. Treatment at the port site would remove toxic pollutants, including metals, to limits identified in an ADEC and/or EPA discharge permit. RFI 066 (PLP 2018-RFI 066) presents PLP's position that EPA's Clean Water Act New Source Performance Standards ELGs do not prohibit the discharge of the concentrate filtrate at the port site. Additionally, water depth and lake-bed topography would preclude the use of a sub-lake slurry pipeline along the South Access routes alignments or the lake portion of the North Access Route (Road and Ferry) (ACC-002). A concentrate pipeline should be co-located with a road to allow inspection and response actions in the event of a pipeline leak/rupture. This option includes a variant to construct an additional 8-inch return water pipeline to pump the concentrate filtrate back to the mine site for reuse. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option is technologically feasible and would be an efficient way to move large volumes of material and reduce truck traffic. 3. Environmental Impacts Test: This route would result in additional fill impacts associated with a wider corridor, but reduced trucking. This option is carried forward as an alternative to be considered in detail in the EIS.	
Concentrate Transport—Rail	CTR-003	***Origination—***Transporting ore concentrate by rail was evaluated by PLP when developing the project design. ***Description—***This option would require the construction of a railroad from the mine site for the transportation of ore concentrate.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Construction of a railroad to move the volume of materials necessary for the project would not be efficient or cost-effective. The cost to construct railroads in Alaska is about 5 times the cost to construct roads. Railroads grades are typically limited to grades of 1 percent or less, with longer bridges. The additional cost of the track, railroad ballast, hardware, and associated equipment is a significant investment. Railroad construction in Alaska costs roughly $9 million per mile; remote road construction costs roughly $1.7 million per mile. Railroads can provide greater efficiencies where high volumes of materials are transported daily; however, the total volume of transported materials projected for the project is low, compared to typical railroad operations. Transport of concentrate, fuel, reagents, and consumables is estimated to be 39 truck round trips per day for the project. The high cost to construct a railroad for the relatively low volume of freight would not be practicable. ***Why Eliminated—***This option would not be practicable due to cost.	
Concentrate Transport—Hybrid Airships	CTR-004	***Origination—***Transporting ore concentrate and bulk cargo by hybrid airships was suggested during public comment on the DEIS as a means to eliminate development outside of the mine footprint. ***Description—***This option considers bulk cargo transport to and from the mine site using heavy-lift hybrid airships or dirigibles rather than the multi-modal transportation infrastructure (road, ferry, lightering, and barge). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Lockheed Martin has announced completion of all required Federal Aviation Administration certification planning steps for hybrid airships, and they are ready to begin construction of the first	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		commercial model (Lockheed Martin 2019). It is anticipated that hybrid airships could deliver heavy cargo to remote locations without the need for roads. However, the proposed mining operations would require a large fleet of airships, the costs of supply would be much higher than the proposed system, and there would be safety and reliability (weather) concerns associated with airships. Moreover, the availability of sufficient airships and a suitable operating hub for the large fleet of airships that would be necessary in time to meet the project requirements is not proven (Skies Magazine 2019). ***Why Eliminated*—**This option is not available, and therefore not practicable.	
Reclamation and Closure Access Options			
Closure—Retain Mine Road	RCA-001	***Origination*—**This is PLP's proposed project. ***Description*—**This option is part of the project, which includes using and maintaining mine access roads for all mine reclamation and closure transportation needs after operations. The project would reclaim the ferry terminals and Amakdedori port at closure, and use barges to transport bulk freight and heavy equipment on Cook Inlet and Iliamna Lake. ***Screening*—**Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Closure—Iliamna Airport and Existing Roads	RCA-002	***Origination*—**This closure option was evaluated by PLP when developing the project design. ***Description*—**This option would, at closure, abandon the project roads and use existing infrastructure (Iliamna Airport and/or Williamsport-Pile Bay Road) for all mine reclamation and closure transportation needs after operations. This option would require air freight of all materials and equipment to the Iliamna airport, and then helicopter transport to the mine area. The mine access roads would be reclaimed, and there would be no road connection to the mine area.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		A variant of this option would be to maintain the roads north of Iliamna Lake and reclaim the road segment south of the lake. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The proposed new roads would be constructed on State of Alaska and private lands under ROW agreements. It is not known at this time what these non-federal landowners would require at closure. It would not be feasible to transport all of the materials and consumables that would be used post-closure using air transportation. Periodic replacement of major water treatment plant components would be required and many would be too heavy and large for aircraft transport. ***Why Eliminated—***This option is not feasible because post-closure transportation cannot be conducted using aircraft.	
Tailings Management Options			
Storage Method—Thickened Tailings Storage	TSF-001	***Origination—***This is PLP's proposed project. ***Description—***Thickened tailings storage is included in the project for bulk tailings. The option is not suited for pyritic tailings that need to remain saturated to prevent them from oxidizing and generating ARD and metals leaching. Thickened tailings are slurry tailings that have been mechanically dewatered, sometimes with settling additives, to create a more viscous, molasses-like material. Thickened tailings typically have a solids content (mass of solids to total mass of the combined solids and liquid mixture) of 45 to 65%. They are piped to the TSF by centrifugal pumps or positive displacement pumps, depending on the topography, distance, head loss, and viscosity. They still require an embankment dam for containment: either a full dam like those used for slurry tailings, or a lower dam, depending on the viscosity. These dams need to be periodically raised to hold the tailings and supernatant water. Some mines discharge thickened tailings from the dam and create a slurry tailings type of TSF with a steeper beach. Other mines discharge thickened tailings from a central tower to produce a cone-shaped TSF with a tailings surface sloped towards the dams. Thickened tailings	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		do not segregate as much as slurry tailings, so that they have relatively consistent particle distributions across the TSF. The yield strength (applied pressure that must be exceeded to make the fluid flow) of the consolidated tailings is 0.4 to 1.6 psf, partly depending on the degree of initial thickening. The dam design would require that the dams accommodate a 200-year flood event when the TSF was at maximum capacity (both events at the same time). ***Screening—***Because this option is included in the project, it is presumed to meet the screening criteria for purposes of detailed environmental review.	
Storage Method—Slurry Tailings Storage	TSF-002	***Origination—***This option is included in the project for the pyritic tailings, and was considered by PLP for the bulk tailings. ***Description—***This option considers slurry tailings for the bulk TSF instead of the thickened tailings method. Slurry tailings are a slightly dewatered product of the milling process. The slurry is a water-like material that is moved by pipeline to the TSF. The slurry typically has a solids content of 10 to 40%, and can flow downgradient by gravity, or be moved by centrifugal pumps, depending on the topography, distance, and head loss. The high water content requires that the tailings be stored behind a dam that must be periodically raised to hold the tailings and supernatant water. The tailings gradually segregate as they flow away from the discharge, with coarser particles closest to the discharge points and finer particles further away. A beach slopes away from each discharge point to the supernatant pond. The tailings consolidate to a yield strength of up to 0.4 psf. The supernatant water is removed to the extent possible, and reclaimed for mill use, or treated and discharged. Some mines use cyclones to split the slurry into coarser and finer fractions, and use the coarser fraction as dam raise fill. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Slurry tailings are the most common method of tailings disposal, and have been successfully produced and managed under a wide range of operating conditions for both bulk and pyritic tailings. The	Eliminated from further analysis (for Bulk Tailings only)

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		feasibility of this method is reliable, and proven at the project scale under these environmental conditions. 3. Environmental Impacts Test: Slurry TSFs entrain more water and have larger supernatant ponds than thickened tailings TSFs. Therefore, they have more potential energy than thickened tailings, and pose a greater risk to the environment should there be an operational problem or a dam failure. PLP has proposed thickened bulk tailings to conserve water and reduce this risk (TSF-001). ***Why Eliminated—***This option is eliminated for the bulk TSF because it would increase overall adverse impacts. It is the proposed design for the pyritic TSF because the pyritic tailings need to be stored subaqueous to prevent acid formation and metal leaching. The pyritic dam design would require accommodation of a 200-year flood event when the TSF was at maximum capacity (both events at the same time). The pyritic tailings would be returned to the completed mine pit at closure for permanent subaqueous storage.	
Storage Method—Paste Tailings Storage (for Bulk Tailings only)	TSF-003	***Origination—***Paste tailings storage was suggested via scoping comments as a potentially efficient and effective method of storage. ***Description—***This option considers paste tailings for the bulk TSF instead of the thickened tailings method. This option is only applicable to the bulk tailings, and not the pyritic tailings that would need to stay saturated to prevent ARD generation and metal leaching. Paste tailings are essentially thickened tailings; thickened with high-density thickeners, cement, and other additives to a toothpaste-like material. They typically have a solids content of 60 to 75%, and a yield strength of 1.6 to 2.0 pounds psf. They are typically moved by pipeline, but require positive displacement pumps instead of centrifugal pumps. Paste tailings particles do not segregate, so tailings characteristics would be relatively uniform throughout the TSF, and coarser tailings would not settle out near the main embankment. Paste tailings are mostly used as backfill in underground mine workings where transport and placement of the paste is aided by gravity, and are typically not disposed of in TSFs.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Paste tailings require specialized high-density thickeners, and are the least common TSF (paste tailings are often used to backfill underground workings). Positive displacement pumps are usually required for transportation to the TSF site, resulting in potential plugging of pipelines with high-density tailing and increased pumping energy requirements. Producing a consistent paste would be a major challenge with the processing, because small changes in the ore-body, especially clay-sized particles, can greatly influence the paste characteristics, such as yield strength and beach slope. The non-segregation of paste tailings is incompatible with the TSF flow through operation concept, and would require water removal by decant piping and/or pumping. 3. Environmental Impacts Test: Paste tailings require additional transportation infrastructure and on-site facilities for handling cement and other thickeners, which would require a large footprint and added impact to the environment. ***Why Eliminated—***Paste tailings are mostly placed in abandoned underground workings, and have minimal surface TSF history and interest. A paste TSF is incompatible with the TSF flow through operations concept. This option would not be less environmentally damaging than the Applicant's proposal.	
Storage Method—Dry Stack Tailings (for Bulk Tailings only)	TSF-004	***Origination—***This storage method was evaluated by PLP when developing the project design. ***Description—***This option considers dry-stack tailings for the bulk TSF instead of the thickened tailings method. This option of dry-stack tailings is only suited for bulk tailings because the pyritic tailings need to stay saturated to prevent ARD generation and metal leaching. Filtering tailings removes water using mechanical filters, and results in tailings with 75 to 85% solids content, and a yield strength of over 3 psf. This creates a soil-like material or "dry cake" that is transported by conveyor or truck to a "dry stack" TSF. These TSFs do not require dams, unless possibly for perimeter	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		berms. The tailings are placed by bulldozers and compactors, as is done in conventional earthwork construction. This option is evaluated in RFI 054 (PLP 2018-RFI 054) and AECOM (2018g). ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The proposed production rate is about 4 times the largest operating filtered project, and almost twice the rate of the largest project currently being studied. The option would greatly complicate the logistics of the milling operation to include frequent clogging of filters, the need for an emergency slurry TSF when the filter plant is down for maintenance, and the large number of personnel and equipment needed to transport and place the filtered tails. The option is not practicable. ***Why Eliminated—***The dry stack tailings method is not practicable for the project.	
Storage Method—Submarine Disposal Storage	TSF-005	***Origination—***This storage method was evaluated by PLP when developing the project design. ***Description—***This option would place the tailings and other mine waste in a waterbody such as a lake to maintain a saturated condition into perpetuity. The concept is to discharge tailings by gravity to a location and depth where they are not likely to oxidize and leach out toxic metals, and where marine life is less abundant. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option would maintain PAG material in a saturated condition without the need for an on-land TSF and maintenance of dams, and other water control features. No waterbodies have been identified that are reasonable locations for dumping mining wastes. This is not a reasonable option. ***Why Eliminated—***This option is not reasonable.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Storage Method—Remove or Make All Tailings Inert	TSF-006	***Origination—***This method was proposed via scoping comments as a measure to reduce local environmental impacts due to tailings storage. ***Description—***This option would involve transporting all of the tailings from the project area to another disposal area, or making the tailings inert to eliminate the ARD and metal leaching potential. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Trucking tailings away from the project area is not reasonable because it would require round-the-clock transport. The project would generate tailings at a rate that would require a truck with triple trailers to leave the mine site approximately every minute. This would require approximately 260 miles of new roads to connect to the existing road system (nearest road is Alaska Route 3—George Parks Highway). Transporting the tails hundreds of miles is not reasonable. Treating the pyritic tailings to make them inert (the bulk tailings are considered relatively inert) would require additional treatment facilities that would need space in the project area, and would introduce new containment structure needs. Methods of making tailings inert include separating pyritic tailings to create a larger bulk TSF and smaller pyrite TSF (this is already part of the proposed project); returning the pyritic tailings to the completed pit at closure to allow natural subaqueous storage (this is also already the proposed project); adding cement to create a cementitious-type material; buffering by mixing in alkaline material like crushed limestone to neutralize the acidity; and refining processes to extract more metals and reduce their metals content in the tailings. Adding cement or alkaline material would be costly; however, cost estimates were not available, so these methods were advanced to the next screening step. Extracting additional metals to make the tailings inert is not practicable from a cost standpoint, because PLP will extract all economically recoverable metals during the milling process.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		3. Environmental Impacts Test: Submerging pyritic tailings and waste rock is the best industry standard for preventing ARD, and is included in the proposed project. Adding cement or limestone to make tailings inert would require the transport of very large volumes of these additives, including possibly developing quarries; and constructing additional infrastructure and treatment facilities in the project area (PLP 2018-RFI 092). Treatment facilities and associated containment structures would require additional space, and would increase environmental impact, with no benefit over the proposed project, which is designed to maintain the tailings in an inert condition in the completed pit. ***Why Eliminated—***The option looks at two sub-options. The first, to move the tailings to another area is not reasonable. The second sub-option, treating the pyritic tailings with cement or limestone, would not be less environmentally damaging than the Applicant's proposal.	
Storage Method—Haul Tailings to Canada using Truck or Rail Trains	TSF-007	***Origination—***Evaluation of an option to truck all waste (i.e., tailings and waste rock) to Canada was suggested during scoping. Evaluation of an option to haul all waste to Canada using rail trains was suggested during the public comment period on the DEIS. ***Description—***This option would involve transporting all of the tailings and waste rock from the project area to a disposal area in Canada. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Trucking tailings away from the project area was evaluated under option TSF-006, and found to be not reasonable. Hauling ore away from the project area using rail trains was evaluated under option TSF-022, and found to be not reasonable (approximately 99 percent of the ore would become tailings after processing). ***Why Eliminated—***This option is not reasonable.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Tailings Dam—Centerline Construction	TSF-008	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which includes the use of centerline construction for the bulk tailings TSF embankment. Centerline construction optimizes the robustness and stability advantages of downstream construction, with the efficiency advantages of upstream construction. The centerline dam begins with a starter dam, and subsequent raises are placed directly above the starter dam or previous raise; over the downstream face; and over the tailings adjacent to the dam. The centerline of the dam crest is maintained in the same vertical plane. The outer part of the dam expands downstream as the dam is raised. The inner part of the dam has raises that stagger over the tailings with the upstream toe of each raise on the same vertical plane. A variation of the centerline method is to bend the centerline in either the upstream or downstream direction to optimize stability and cost. Centerline dams can be built out of rock, soil, and tailings. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in Alternative 1a, Alternative 1, and Alternative 3
Tailings Dam—Downstream Construction	TSF-009	***Origination—***This construction method was evaluated by PLP when developing the project design. ***Description—***Under this option, downstream tailings dam construction is considered only for the bulk TSF, instead of the centerline method (the pyritic TSF is proposed as a downstream dam). Downstream tailings dams can be constructed using rock, soil, or tailings in various combinations. Construction starts with a starter dam in the same way as for a centerline dam. Subsequent stages (raises) are built on top of the downstream slope of the previous dam. The centerline of the dam crest moves downstream. Downstream dams are constructed in the same way as conventional water storage dams, except for being raised in stages as mining progresses, instead of all at once. This option is evaluated in RFI 075 (PLP 2018-RFI 075). RFI 075 presents two variants of a downstream dam: one with buttresses, and one without.	Included in Alternative 2

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: There is adequate space and material to construct downstream dams at the bulk TSF. It would require more fill and be more expensive than the proposed centerline dam, but it does not appear to make the project uneconomic. 3. Environmental Impacts Test: The scoping concern that drives the consideration of downstream dams is to decrease the risk of dam failure. The variant of a downstream dam without buttresses appears less safe than the proposed project, so it is therefore eliminated. The variant of a downstream dam with buttresses appears, at this early screening stage, to have a factor of safety equal to the proposed project, and yet would increase other impacts, such as creating a larger footprint for the TSF. ***Why Eliminated—***The variant of a downstream dam without buttresses is eliminated because it would potentially increase environmental impacts. The downstream dam with buttresses variant is carried forward for detailed evaluation in the EIS, even though it would have a larger footprint, because of the level of concern expressed during scoping for tailings impoundment safety.	
Tailings Dam—Upstream Construction	TSF-010	***Origination—***This construction method was evaluated by the USACE. ***Description—***Under this option, use of upstream tailings dam construction is considered. Tailings dams built by the upstream method of construction are raised by using rock, soil, and tailings in various combinations as dam fill. A starter dam is first built in the same manner as a centerline or downstream dam. Trapezoidal-shaped raises are built on top of each other at an offset toe-to-crest design, moving the dam crest and centerline upstream so that the upstream part of the dam is situated over tailings in the TSF. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Upstream raises are the oldest and most economic type of tailings dam construction. An upstream dam contains about one-third of the fill volume of a downstream dam, and one-half the volume of a	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		centerline dam. This would result in construction time savings conducive to the project's short construction seasons, and therefore, reduced costs. However, fill can only be placed on tailings that have had time to consolidate, and thereby provide a strong foundation for the raises. Otherwise, the underlying tailings could be saturated to the extent they could liquefy as a result of seismic activity and cause the dam to fail. A rate of tailings rise of 15 to 30 feet per year is considered to be the upper limit of allowing sufficient time for tailings consolidation to provide a stable tailings foundation for upstream raise construction. The planned rate of tailings rise for the project is at the upper end of this range, and likely too fast to allow enough time for consolidation. Therefore, an upstream raise is likely not feasible because of the fast rate of tailings rise and liquefaction potential in a high-seismic-potential area. 3. Environmental Impacts Test: The need for less dam material means less material needs to be quarried or borrowed for dam fill, resulting in fewer environmental impacts. However, the higher potential for tailings liquefaction results in a higher risk of dam failure, and inundation of the land and waterbodies by tailings. ***Why Eliminated—***PLP is proposing a centerline dam for the bulk TSF and downstream dam for the pyritic TSF, which are considered more stable construction methods and reduce the risk of dam failure. Upstream construction is eliminated from further consideration because of potential environmental impacts from a higher risk of dam failure.	
Storage Method—Emergency Storage for TSF	TSF-011	***Origination—****S*coping comments expressed concern regarding the stability and environmental impacts of a TSF failure due to an unexpected event such as seismic activity or unexpected water volumes. ***Description—***Extreme seismic and water events are not unexpected in current TSF operations, and anticipation of them is a key element of current TSF design, construction and operating best available practices. This option would require an embankment robust enough to resist ground shaking caused by earthquakes, blasting and equipment, and an emergency storage/overflow containment area to minimize risk of tailings spills from excessive buildup of water in the TSF. The embankment dam design would be required to be robust enough to resist the operating basis earthquake and maximum credible earthquake. The design would require that the dams accommodate a 200-year flood event when the TSF was at maximum capacity (both	Included in all action alternatives

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		events at the same time). An emergency storage facility would provide redundancy, but at the expense of having to build a separate facility that would require the disturbance and use of additional land. Any redundancies that could be achieved would be more economically achieved by more robust TSFs, WMPs, seepage collection systems, and sediment ponds and other related facilities. ***Screening—***Because this option is included in the proposed project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	
Tailings Production—Segregated Bulk/Pyritic Tails	TSF-012	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which involves keeping both bulk and pyritic tailing streams separate. Separate tailings streams are a by-product of the mining process, so no additional steps are required. This option would require separate TSFs for bulk and pyritic tails. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Tailings Production—Blended Bulk/ Pyritic Tails	TSF-013	***Origination—***This option was evaluated by PLP as a potential tailings production and storage method. ***Description—***Under this option, bulk and pyritic tailings streams would be combined into one for the purpose of having a single TSF. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option requires an additional step to blend tailings streams, and maintain more water in the TSF to keep the pyritic tailings subaqueous to mitigate ARD and metal leaching potential. The entire facility would need to be managed in perpetuity to maintain the wet closure, and to collect and treat seepage. A blended facility would also need to be lined, which would hinder the flow-through design concept of the bulk TSF, and thereby prevent the bulk tailings from dewatering over time and becoming a stable landform.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		3. Environmental Impacts Test: The blended tails would result in a large volume of tailings—and therefore, seepage water—that would need to be managed for potential ARD metal leaching. The wet closure would have a long-term post-closure dam failure risk higher than the proposed project. ***Why Eliminated***—This option would increase overall adverse impacts because the pyritic tails would "contaminate" the bulk tails, and require subaqueous storage in perpetuity.	
Bulk Tailings Basin—Unlined	TSF-014	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which would discharge thickened bulk tailings into an unlined basin, and provide TSF solids and water management in a manner that results in the TSF groundwater level sloping down towards the main embankment, and the seepage passing through a collection system built under the main embankment, and being collected by the bulk TSF main seepage collection pond. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Bulk Tailings Basin—Lined	TSF-015	***Origination—***This option was evaluated by PLP when developing the project design. ***Description—***This option has the bottom of the bulk TSF fully lined so that the bulk tailings would not be in contact with the ground surface. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: It is practicable to fully line the bulk TSF, although it would increase costs. However, lining of the bulk TSF would create a bathtub of water in the lower part of the TSF, because the liner would impede the planned flow-through of seepage through the tailings and main embankment. This would result in saturated lower tailings that could be susceptible to static and seismic liquefaction during operations, and through closure and post-closure, even in thickened tailings several hundred feet deep. Technologies have been evaluated to construct drains above bottom liners to	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		enhance seepage out of TSFs through penetrations in the liner at the bottom of the upstream slope of the embankments. However, these technologies have not been proven and implemented on a similar scale. The biggest challenge is with construction and long-term integrity of the "boot" around the penetration through the liner at the bottom of the upstream slope; which, once covered with tailings, cannot be accessed during operations for repairs in the event that the "boot" fails. 3. Environmental Impacts Test: Lining the impoundment would reduce supernatant water seepage from the impoundment. However, all liner systems of this scale have defects that lead to seepage, and a downstream seepage collection and monitoring system (as proposed for the unlined facility) would be required with or without a liner. Although the seepage downstream of the TSF would likely have a lower concentration of supernatant water (after mixing with groundwater), it would still need to be captured and directed to a water treatment plant prior to discharge. Therefore, the liner would only serve to reduce the concentration of supernatant in groundwater under and between the impoundment and the seepage collection system (i.e., on site). Groundwater downstream of the seepage collection system (i.e., groundwater migrating off site) would be expected to have the same concentration, with or without a liner under the impoundment. Potential for tailings impoundment failures and resulting impacts on water quality and fisheries was a major scoping concern. This option would result in poor consolidation of tailings that would lead to long-term saturation of the deeper tailings, and susceptibility to static and seismic liquefaction. This would defeat the drainage objective of the proposed thickened TSF. The ultimate result would be higher potential mobility of the tailings, and prevention of the tailings from consolidating over time by gradual drainage, and ultimately becoming a stable landform. ***Why Eliminated*—**This option would increase overall adverse impacts because the liner would retain water in the bulk tails and increase the risk of embankment failure and tailings mobility.	

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Pyritic Tailings Basin—Lined	TSF-016	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which has the bottom of the pyritic tailings TSF fully lined so that the pyritic tailings would not be in contact with the ground surface. Additionally, this option allows for pyritic tailings to be stored sub-aqueously without the circulation of seepage water. ***Screening—***Because this option is included in the project, it is presumed to meet the screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Pyritic Tailings Basin—Unlined	TSF-017	***Origination—***This option was evaluated by PLP when developing the project design. ***Description—***Under this option, the pyritic TSF would be unlined. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: It is practicable with existing technology to build an unlined TSF, and it would reduce costs. 3. Environmental Impacts Test: PLP has proposed a lined pyritic TSF to keep the tailings saturated and maintain a water cover. Subaqueous storage during operations would prevent the tailings from oxidizing, and mitigate acid generation and metal leaching. An unlined facility would increase seepage and make it difficult to maintain the water cover, and the tailings would likely generate acid and leach metals. ***Why Eliminated—***This option would increase overall adverse impacts.	Eliminated from further analysis
TSF Location—NFK West TSF Location	TSF-018	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, and would store the bulk tails 2 to 3 miles west of the open pit. The pyritic tails would be stored at the NFK East location (TSF-020). ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives

Table B-1: Project Options Considered

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TSF Location—NFK North TSF Location	TSF-019	***Origination—***This TSF location was evaluated by PLP when developing the project design. ***Description—***This option would store pyritic tailings about 2 miles north of the open pit. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This site is close to the process plant, has sufficient storage capacity for all tailings, and allows for the segregation of bulk and pyritic tailings. This option has the highest efficiency, making it the least costly option. 3. Environmental Impacts Test: The NFK North location has more wetlands and anadromous streams than NFK East and West. This option would increase impacts to wetlands and anadromous streams. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	Eliminated from Further Analysis
TSF Location—NFK East TSF Location	TSF-020	***Origination—***This is PLP's proposed project. ***Description—***This location is proposed by PLP to store the pyritic tailings about 1 mile west of the open pit. The bulk tailings would be stored at the NFK West location (TSF-018). ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Combined TSF and Operating Pond	TSF-021	***Origination—***This option was evaluated by USACE to avoid impacts associated with a separate WMP. ***Description—***This option would add the operating pond (part of the main WMP) to the bulk TSF. It would result in additional water stored in the bulk TSF, and would eliminate the need for or reduce the size of the main WMP. The objective would be to perform all bulk tailings and water management operations at one facility, instead of two facilities.	Eliminated from further analysis

Table B-1: Project Options Considered

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		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: This option is compatible only with the slurry tailings disposal method (TSF-002). The option is not compatible with the thickened tailings disposal objective of supernatant drainage and consolidation of the tailings to a stable landform. Production of thickened tailings requires the dewatering of tailings as part of the milling process. The bulk TSF is planned to store thickened tailings that have been previously dewatered to the extent that they would be discharged to the bulk TSF at a solids content of 55 percent. This plan would result in a drier and more stable tailings deposit than would result from slurry tailings discharge. A combined bulk TSF/ Operating Pond facility could be achieved by either not thickening the tailings, and thereby depositing slurry tailings; or by building an internal embankment in the combined facility to separate the thickened tailings from water. 3. Environmental Impacts Test: The proposed main WMP has a footprint of approximately 925 acres, of which about 750 acres contain the normal operating pond level, and the remaining 175 acres are for the maximum operating pond level and probable maximum flood. Much of this area is wetlands. If the bulk TSF also contained the Operating Pond, there would be a reduction in impacts to wetlands and other waters. However, a combined bulk TSF/Operating Pond facility that combined non-thickened tailings and water would be a slurry TSF that is contrary to the environmentally safer consideration of a thickened TSF; and in conflict with current global mining objectives of developing drier TSFs as best available technology, regardless of water supply factors, and moving the industry towards zero tailings dam failures. A combined bulk TSF/Operating Pond facility with separate thickened tailings and water storage areas would require a bulk TSF area and a water retention area separated by a divider dam; and would require a footprint that would be larger than the planned bulk TSF footprint. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project. The option also conflicts with the objective of reducing the risk of embankment failure by using thickened tailings.	

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Cook Inlet Drainage TSF Locations	TSF-022	***Origination—***This option was evaluated by PLP when developing the project design. ***Description—***This option would transport the ore to Cook Inlet drainages, where it would be milled; the tailings would then be piped to a valley fill tailings facility. Seven drainages were considered for TSF locations: six above Kamishak Bay, and one above Iniskin Bay. This option would require railroad transportation of all ore between the mine site and the mill because of the large volumes of material to be transported. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: The drainages considered under this option are in distant mountainous terrain. PLP would need to run 24 train trips per day, which would require 1,000 rail cars and 16 locomotives operating at all times. This would require at least two loading/unloading facilities at each end, rail loops, sidings, and two tracks in all places; and likely more tracks on steep uphill segments. Even with multiple loading and unloading facilities, it would require loading each train in an average of 2 hours, something that the Alaska Railroad was not able to accomplish at Usibelli Coal Mine, where loading took 2.5 to 4 hours. The scale of equipment and infrastructure required and the difficult logistics of loading, unloading, and operating 24 train trips per day are factors that make these TSF locations not reasonable from a technical standpoint. ***Why Eliminated—***The option would not be reasonable from a technical standpoint.	Eliminated from further analysis
Low-Permeability Cover on Bulk TSF	TSF-023	***Origination—***This is PLP's proposed project. ***Description—***PLP proposes dry closure of the Bulk TSF with a low-permeability cover. PLP intends to use low-permeability natural glacial till material from the site, but will consider other options during final design and the State of Alaska dam safety, reclamation, and closure review and permitting processes. Other options that would be considered include synthetic liners and geosynthetic clay liners. ***Screening—***Because this option is included in the project, it is presumed to meet the screening criteria for purposes of detailed environmental review.	Included in all action alternatives

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Store and Release Cover on Bulk TSF	TSF-024	***Origination—***Evaluation of SRCs for the TSF was suggested during scoping. ***Description—***This option considers use of an SRC on the bulk TSF. SRCs are designed to retain precipitated water in inert material overlying the tailings, where the water is then removed by evapotranspiration. SRC systems are typically most effective in warm, semi-arid climates where there is no, or limited, net precipitation (annual evaporation exceeds precipitation), even if there may be elevated levels of precipitation in some seasons (e.g., monsoon areas). Typical SRC systems consist of a layer of soil (usually well-graded with significant fines) with dense vegetation coverage on top. The proposed cover system would function as a partial SRC, in that the growth medium (soil) and overlying vegetation would serve to trap a portion of the precipitation, which would then undergo evapotranspiration. However, net precipitation levels and the nature of the precipitation (freezing winters, followed by heavy freshet runoff, followed by wet summer and fall conditions) dictate that there would always be significant surface runoff. Annual average precipitation in the NFK basin is 56 inches, with evapotranspiration from natural (reclaimed) areas at 8 inches and sublimation at 4 inches, for net precipitation of 44 inches—a significant portion of which is rapidly released during the freshet. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: PLP's design attempts to minimize water infiltration and resultant seepage. Store and release covers could result in increased infiltration, and resultant seepage and degraded water quality. This option misunderstands the project design, and is therefore not a reasonable option. ***Why Eliminated—***This is not a reasonable option.	Eliminated from further analysis
Mine Area TSF Locations	TSF-025	***Origination—***PLP evaluated 26 TSF location options and provided detailed information for each in their response to RFI 098 (PLP 2018-RFI 098). USACE reviewed each of these locations to determine if they would be a suitable alternative location for the Bulk TSF, which is proposed to be in the NFK-West location (TSF-018). (This option does not consider these locations as suitable for the pyritic TSF, because	Eliminated from further analysis

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		it would be a much smaller facility and need to be in close proximity to the pit to allow return of the contents during closure.) ***Description—***The option reviews 26 locations for the TSF. The pumping distance for the tailings would range from 4 to 25 miles. Several attributes of the proposed bulk TSF were important considerations during this review. The proposed bulk TSF would have: 1. Ground conditions that allow the capture of seepage from the TSF 2. A capacity for 1.14 billion tons of tailings 3. A footprint of 2,839 acres 4. Wetlands impacts of 1,828 acres 5. Impacts to 8.8 miles of stream, 7.4 miles and 4.4 miles of which are fish-bearing and anadromous, respectively ***Screening—*** 1. Purpose and Need Test: All 26 optional locations would meet the purpose and need. 2. Reasonable and Practicable Test: Options 1, 2, 10, 11, and 13 through 23 would be on thick, granular, high-permeability overburden that would preclude control and collection of seepage from the TSF. The inability to control seepage makes these options not feasible. Additionally, Option 5 has a capacity of 0.7 billion tons and would not be feasible for the proposed 1.14 billion tons of bulk tailings. The remaining options appear to be practicable. 3. Environmental Impacts Test: The remaining options would all increase the wetlands and stream miles filled when compared to the proposed project. Additionally, the remaining options would all be in the NFK, South Fork Koktuli (SFK), or UTC drainages; and would pose risks similar to the proposed project in the event of a tailings dam failure. ***Why Eliminated—***Options 1, 2, 5, 10, 11, and 13 through 23 are not practicable. The remaining options would not be less environmentally damaging than the Applicant's proposal.	

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Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
Tailings Dam Made of Concrete	TSF-026	***Origination—***Consideration of tailings dams made of concrete was requested during public comment on the DEIS due to concerns with tailings dam failures. ***Description—***Under this option, the tailings dams would be constructed primarily of concrete instead of the proposed earthfill and rockfill dams. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Constructing the dams using concrete would require procuring and transporting very large amounts of cement and other additives. Costs of producing concrete at Red Dog are approximately 10 times the cost of making concrete in an urban area. Earthfill and rockfill dams are flexible and can adjust to ground settlement and/or tailings forces, while concrete dams are rigid and not flexible, so they would be subject to cracks and leaks if subjected to the same ground settlement and tailings forces. 3. Environmental Impacts Test: Concrete dams are not inherently safer than earthen dams. During design of dams, design criteria are developed that stipulate the performance of the dam, and the criteria would generally be the same for either an earthfill or concrete dam, so there would not be an expected environmental benefit from a concrete dam. The concrete dam would require additional footprint for batch plants, material stockpiles, disposal of earth and rock that would otherwise be used for the dam, and maintenance shops for the fleet of concrete producing and hauling equipment. Cement transportation will result in additional shipping, trucking, and ferry operation and associated impacts. ***Why Eliminated—***This option would not result in safer structures than the proposed earthfill and rockfill dams and it would not be less environmentally damaging than the Applicant's proposal.	Eliminated from further analysis

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Redundant TSF Dams to Catch Material in the event of Failures	TSF-027	***Origination—***This option was suggested during public comment on the DEIS. ***Description—***This option would construct redundant dams of similar capacity downstream of the proposed tailings dams to retain any material that could be released should there be a failure of the primary dam. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: In the current state-of-practice, there is every scientific, engineering, and construction technique available to design a dam wall that will function properly. Dams are built in lifts, and if the starter dam or raises shows the slightest sign of non-performance, future raises can be re-designed and adjusted to restore performance, and buttresses can be built over the downstream slope and keyed into the foundation bedrock to increase the stability of the embankment. This response does not address the R&P test for the redundancy- it could and is practicable, but would be eliminated under environmental considerations 3. Environmental Impacts Test: The footprint of the entire facility would be larger, leading to greater overall environmental impact. A larger footprint would also collect more precipitation leading to greater need for operating water volume storage or treatment needs. ***Why Eliminated—***This option would increase the overall adverse environmental impacts compared to the proposed project.	Eliminated from further analysis
Locate Tailings Storage Facilities Upgradient of the Pit	TSF-028	***Origination—***This option was suggested during public comment on the DEIS. ***Description—***This option would locate the tailings storage facilities upgradient of the open pit so that the open pit would capture any material that would flow in the event of an embankment failure. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need.	Eliminated from further analysis

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		2. Reasonable and Practicable Test: The proposed open pit would be in the upper reaches of the SFK River watershed near the topographic divide between the UTC and NFK River watersheds. There is not enough area upgradient of the pit for the TSFs making this option reasonable or logistically possible. ***Why Eliminated—***This option is not reasonable.	
Storage Method—Remove Pyritic Tailings	TSF-029	***Origination—***This option was suggested during public comment on the DEIS. ***Description—***This option would involve transporting the pyritic tailings from the project area to another disposal area. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Trucking pyritic tailings away from the project area is not reasonable because it would require round-the-clock transport of large quantities of material. The project would generate pyritic tailings at a rate that would require a truck with triple trailers to leave the mine site approximately every 10 minutes. This would require approximately 260 miles of new roads to connect to the existing road system (nearest road is Alaska Route 3—George Parks Highway). Transporting the tailings hundreds of miles is not reasonable. ***Why Eliminated—***The option is not reasonable.	Eliminated from further analysis
Fill open pit with bulk tailings and cover with embankment material	TSF-030	***Origination—***Evaluation of an option to completely fill the open pit with tailings. This was suggested in a comment on the Preliminary DEIS to prevent the need for treatment of water from the open pit. ***Description—***PLP is proposing to place the pyritic tailings into the pit at closure. This option would also place bulk tailings in the pit above the pyritic tailings and then cover with embankment material. ***Screening—*** 1. Purpose and Need: Meets the purpose and need.	Eliminated from further analysis

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		2. Reasonable and Practicable Test: This option would require moving approximately 1 billion tons of bulk tailings and embankment material 3 to 4 miles from the bulk TSF to the open pit at closure. This option is economically infeasible, and therefore not reasonable because of the cost to load, haul, and place the material; which, even though it is thickened tailings, would still be too wet to compact. The tailings volume would exceed the available pit volume, which would require that excess tailings be either mounded on top of the pit or left in the bulk TSF. There may not be offsetting cost savings because monitoring and treating water from the former pit area would still likely be necessary. ***Why Eliminated*—**This option is not reasonable.	
PAG Waste Rock Storage Options			
Storage Method—Store PAG with Pyritic Tails	PAG-001	***Origination*—**This is PLP's proposed project. ***Description*—**All PAG waste rock would be stored in the pyritic TSF. PAG waste rock would be placed in a ring around the interior of the pyritic TSF and above the pyritic tailings. All PAG waste rock would be returned to the pit at closure with the pyritic tailings for permanent subaqueous storage. ***Screening*—**Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Storage Method—Store PAG in LGO stockpile	PAG-002	***Origination*—**This option was PLP's proposed project in the December 2017 DA permit application (PLP 2017). PLP's May 11, 2018, project description update changed the process, and would place all PAG in the pyritic tails TSF. ***Description*—**This option would store PAG with the LGO stockpile. ***Screening*—** 1. Purpose and Need Test: Meets the purpose and need.	Eliminated from further analysis

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		2. Reasonable and Practicable Test: This option is no longer viable because an LGO stockpile is not proposed. ***Why Eliminated—***The proposed project does not have an LGO stockpile, and therefore, the option is not reasonable.	
Storage Method—Separate WRF Storage	PAG-003	***Origination—***This storage method was evaluated by PLP when developing the project design. ***Description—***This option would involve the construction of a separate permanent WRF. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Separate waste rock facilities are common at mines. This option requires the construction of a separate facility, and water management and access infrastructure. The facility would be exposed to the air, and therefore would generate ARD and metal leaching that would need to be collected and treated. Additional collection and treatment facilities and infrastructure would be needed. 3. Environmental Impacts Test: Construction of infrastructure separate WRF would increase wetland impacts. ***Why Eliminated—***This option would not be less environmentally damaging than the Applicant's proposal.	Eliminated from further analysis

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Main Water Management Pond Options			
Mine Area Main WMP Locations	WMP-001	***Origination—***PLP Main WMP location. ***Description—***The Main WMP would be in the NFK drainage and would be sized and designed to store excess site water plus the design storm event, with additional space for freeboard. The Main WMP would be a fully lined facility over its reservoir area and dam upstream slope. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review. Response to RFI 150 (PLP 2019-RFI 150) describes the optimal location for the Main WMP from an engineering and operability perspective.	Included in all action alternatives
Mine Area Main WMP Locations	WMP-002	***Origination—***PLP evaluated seven alternate locations for the Main WMP and provided detailed information for each in their response to RFI 150 (PLP 2019-RFI 150). ***Description—***The option reviews the seven alternate locations for the Main WMP (see RFI 150). Each alternative met the water storage requirement and is located in the general project area. The same general design features (earth fill embankment, lined facility) were used for each alternative. ***Screening—*** 1. Purpose and Need Test: All seven optional locations would meet the purpose and need. 2. Reasonable and Practicable Test: – Complete removal of the pyritic TSF and return of the pyritic tailings and PAG waste rock to the open pit is considered a key part of the project proposal that reduces overarching environmental effects to the plan. This requires a pyritic TSF location of sufficient size adjacent to the pit, with the proposed pyritic TSF location being the only feasible one identified. Therefore, the use of that location for the pyritic TSF takes priority and main	Eliminated from further analysis

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		WMP Alternatives 1 and 2 were determined to be not reasonable due to their overlap with the pyritic TSF footprint. – Alternatives 3, 4, 5, 6, and 7 are not reasonable locations. These locations would result in significant additional construction and operational impacts associated with the management and movement of water between facilities. They would also increase the spill risk due to the requirement for much longer tailings and process water pipelines. – Alternative 3 was determined to be not reasonable due to the size of the required pond, the proximity to the open pit, and the large drainage area impacted. Alternatives 4, 5, and 6 would all require unnecessarily high main embankments (315 to 425 feet) because they are in a steep-sided valley, which presents additional challenges with the construction and maintenance of an effective liner given a fluctuating water pond level. As a result these alternatives were determined to be unfeasible. – Alternatives 5 and 6 would share a portion of the embankment with the proposed pyritic TSF. The potential for fluctuating loading and the lack of physical access to the southern face of the southern embankment of the pyritic TSF during operations was identified as a significant risk factor and as a result these alternatives were determined to be unfeasible. This overlap would also have impacted the effective construction and full use of the pyritic TSF. – Alternative 7 was determined to be unfeasible due to the significant topographic crest between the site and other facilities outlined above, and the large drainage area impacted which would have resulted in significant additional water management requirements. ***Why Eliminated—***The seven alternate locations are not reasonable or not feasible.	

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Water Treatment and Air Options			
Water Treatment	WTP-001	***Origination—***This is PLP's proposed project. ***Description—***This option is part of the project, which involves water treatment technology to meet the Alaska water quality discharge standards. To meet the water quality standards in receiving body per the Alaska Water Quality Criteria Manual (ADEC 2008a), and to meet the mine plan requirements, two WTPs would be required: WTP #1 near the open pit; and WTP #2 near the main WMP. WTP #1 would use chemical precipitation and filtration for metals removal. WTP #2 would use chemical precipitation followed by RO for meeting TDS/sulfate limits, and biological selenium removal. ***Screening—***Because this option is included in the project, it is presumed to meet the three screening criteria for purposes of detailed environmental review.	Included in all action alternatives
Enhanced Water Treatment	WTP-002	***Origination—***Evaluation of an option that treats water for discharge to meet the water quality of the natural receiving waters was suggested during scoping. ***Description—***This option would require the water quality of all discharged water to be the same as receiving water. Additional water treatment steps would likely be required. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: It appears this suggestion was made without an understanding of the regulations that apply to water discharges. PLP would be required to achieve applicable water quality standards, and has committed to achieving the standards at the end of pipe (i.e., no mixing zones). The standards are developed by ADEC to be protective of designated uses to include human health and aquatic life; therefore, the enhanced treatment would add cost, but provide no benefit, making this option not reasonable. ***Why Eliminated—***This option would increase costs but provide no benefit, making this option not reasonable.	Eliminated from Further Analysis

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Enhanced Water Treatment—Zero Metal Discharge	WTP-003	***Origination—***Evaluation of an option that would result in zero discharges of metals into the watershed was suggested during scoping. ***Description—***This option would require there to be zero metal content in discharged water. To meet zero metal content, chemical precipitation followed by RO, and an additional ion exchange step, would be required to completely remove the metals. The treatment system would essentially generate ultrapure water for discharge by providing a treatment that is well beyond what is required to meet the water quality standards, thereby resulting in "over treatment." This water is expected to have very low TDS or mineral content, and is likely to be "too clean" for discharge (i.e., some constituents have minimum standards). To address potential toxicity associated with this flow, addition of certain constituents is likely required to make it amenable for discharge, resulting in some metal content. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: It appears this suggestion was made without an understanding of the regulations that apply to water discharges. PLP would be required to achieve applicable water quality standards, and has committed to achieving the standards at the end of pipe (i.e., no mixing zones). The standards are developed by ADEC to be protective of designated uses to include human health and aquatic life; therefore, the additional treatment would add cost, but provide no benefit, making this option not reasonable. ***Why Eliminated***—This option would increase costs, but provide no benefit, making this option not reasonable.	Eliminated from further analysis
Enhanced Water Treatment—Reverse Osmosis	WTP-004	***Origination—***Evaluation of an option that would require RO for all water treatment was suggested during scoping. ***Description—***This option would use chemical precipitation, followed by RO processing for water treatment at WTP #1 and WTP #2. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need.	Eliminated from further analysis

Table B-1: Project Options Considered

Option	Option #	Option Details and Screening ❖ Option Details: Origination and Description ❖ Screening Criteria: 1. Purpose and Need Test; 2. Reasonable and Practicable Test; 3. Environmental Impacts Test ❖ Reason Eliminated from Further Analysis (if applicable)	Outcome
		2. Reasonable and Practicable Test: PLP would be required to achieve applicable water quality standards, and has committed to achieving the standards at the end of pipe (i.e., no mixing zones). The standards are developed by ADEC to be protective of designated uses to include human health and aquatic life; therefore, the additional treatment would add costs, but provide no benefit, making this option not reasonable. ***Why Eliminated—***RO-based treatment is primarily required for TDS and sulfate removal. Because both TDS and sulfate are expected to be below the discharge limits in the influent water to WTP #1, RO is not required. Chemical precipitation followed by filtration would be sufficient to meet the discharge limits for WTP #1, and RO-based treatment can be limited to just WTP #2. The option of using RO at both WTPs is not reasonable, and would unnecessarily increase the carbon footprint, facility size, and the residual solids disposal requirements.	
Enhanced Water Treatment—Chaga Filters	WTP-005	***Origination—***Evaluation of an option to use chaga mushroom filters for water treatment was suggested during public comments on the DEIS. ***Description—***This option would treat discharge water using a filter containing chaga mushrooms. ***Screening—*** 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Chaga mushrooms are not known to be effective at treating water from mining operations. The option is infeasible. ***Why Eliminated—***Chaga mushrooms are infeasible for treating water from the proposed mining operation.	Eliminated from further analysis
Airtight Structure for Emissions Collection	AIR-001	***Origination—***Evaluation of an option that covers the development with an airtight structure to contain ARD from getting into the air was suggested during scoping. ***Description—***This option calls for the development and construction of an airtight structure that covers the mine site. Any fumes or gasses would be cleaned before the air can be re-released into the atmosphere.	Eliminated from further analysis

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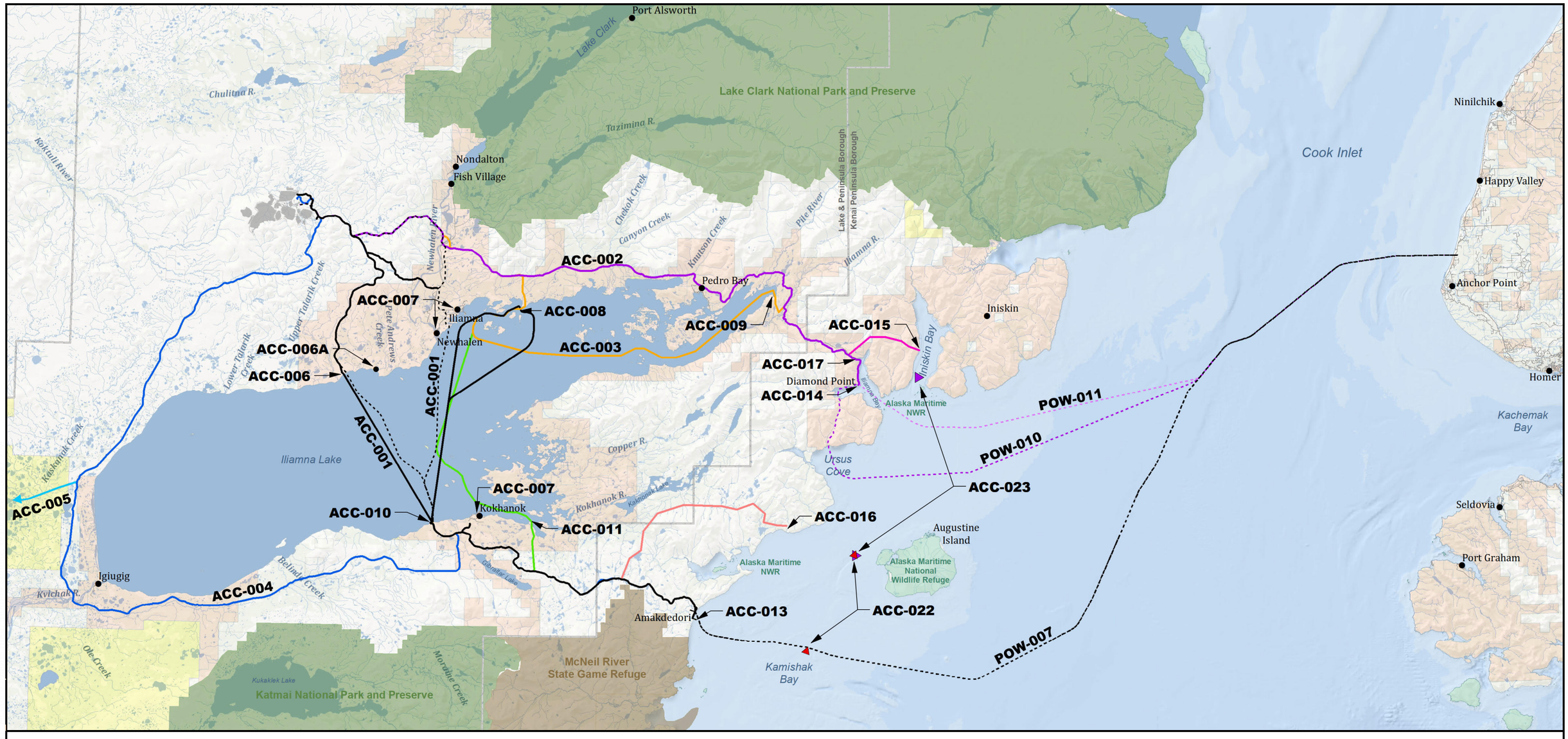
		Screening— 1. Purpose and Need Test: Meets the purpose and need. 2. Reasonable and Practicable Test: Design for this type of structure is not reasonable, because there is no air quality concern with emissions from ARD. An airtight structure for the project would be the largest constructed structure in the world. ***Why Eliminated—***This option is eliminated because it is not reasonable, and the suggestion is based on a misunderstanding of potential ARD impacts.	

Notes:
ADEC = Alaska Department of Environmental Conservation
ADOT&PF = Alaska Department of Transportation and Public Facilities
ARD = acid rock drainage
CFR = Code of Federal Regulations
CO = carbon monoxide
DA = Department of the Army
ADF&G = Alaska Department of Fish and Game
DEIS = Draft Environmental Impact Statement
EIS = Environmental Impact Statement
ELGs = Effluent Limitation Guidelines
EPA = US Environmental Protection Agency
LGO = lower-grade ore
LNG = liquified natural gas
MLLW = mean lower low water
MW = megawatt
MWh = megawatt-hours
NEPA = National Environmental Policy Act
NFK = North Fork Koktuli
NOx = oxides of nitrogen
NPV = net present value
PAG = potentially acid-generating
PLP = Pebble Limited Partnership
PM = particulate matter
psf = pounds per square foot
RFI = Request for Information
RO = reverse osmosis
ROR = run-of-river
ROW = right-of-way
SFK = South Fork Koktuli
SO_2 = sulfur dioxide
SRC = store and release cover
TDS = total dissolved solids
tpd = tons per day
USACE = US Army Corps of Engineers
UTC = Upper Talarik Creek
VOCs = volatile organic compounds
WMP = Water Management Pond
WRF = Waste Rock Facility
WTP = Water Treatment Plant



Sources: AECOM; PLP; USGS; ADNR

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Options
- South Access Route (Road and Ferry) - ACC-001, 006, 010, 013
- North Access Route (Road Only) - ACC-002, 014, 017
- North Access Route (Road and Ferry) - ACC-003, 008, 009
- EagleBayFerryOptions
- West Access Route - ACC-004
- HDR_PD_Power_Lines
- Bristol Bay Access Route - ACC-005
- Kokhanok East Ferry Terminal - ACC-011
- Knoll Head/Iniskin Bay Port Site - ACC-015
- Fortification Bluff/Rocky Point Port Site - ACC-016
- Amakdedori Offshore Lightering - ACC-022
- Iniskin Offshore Lightering - ACC-023
- South Pipeline - POW-007
- North Pipeline - POW-010
- North Pipeline - POW-011

Other Features
- Proposed Mine Footprint
- Existing Roads
- Borough Boundary
- Bureau of Land Management
- Native Patent or IC; Native Selected
- State Patent or TA; State Selected
- State Game Refuge/Sanctuary
- National Wildlife Refuge
- National Park

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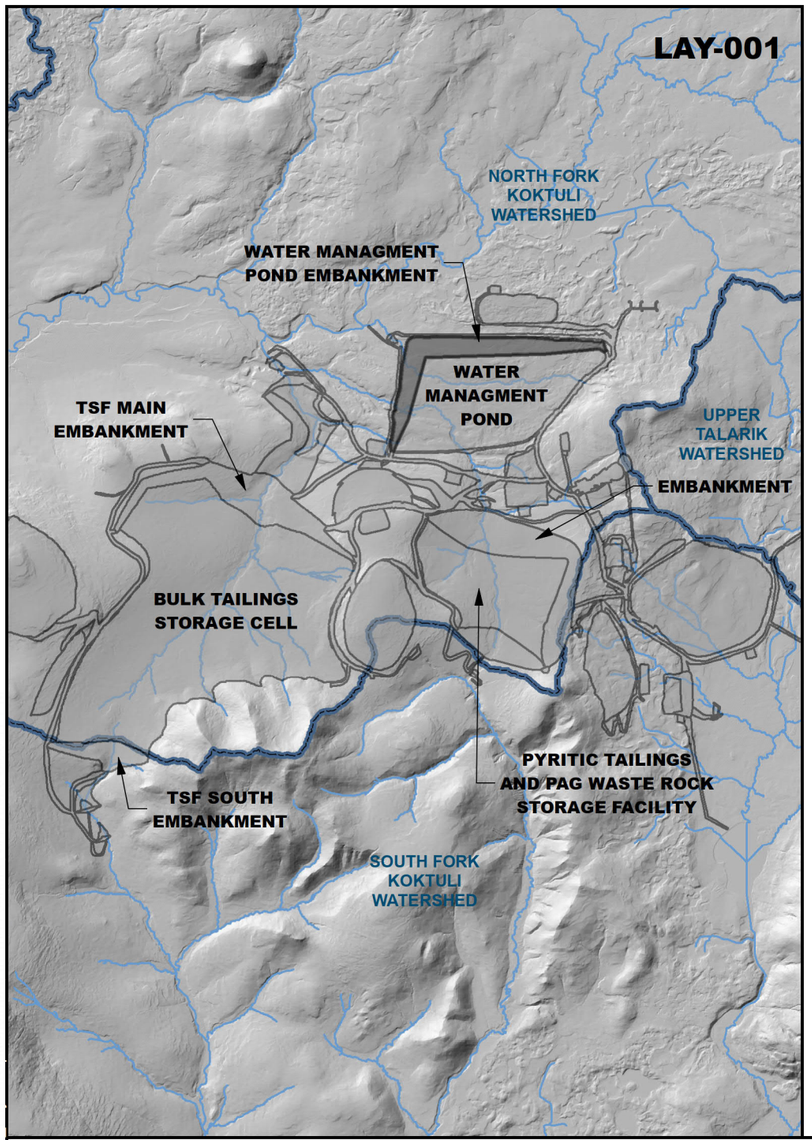
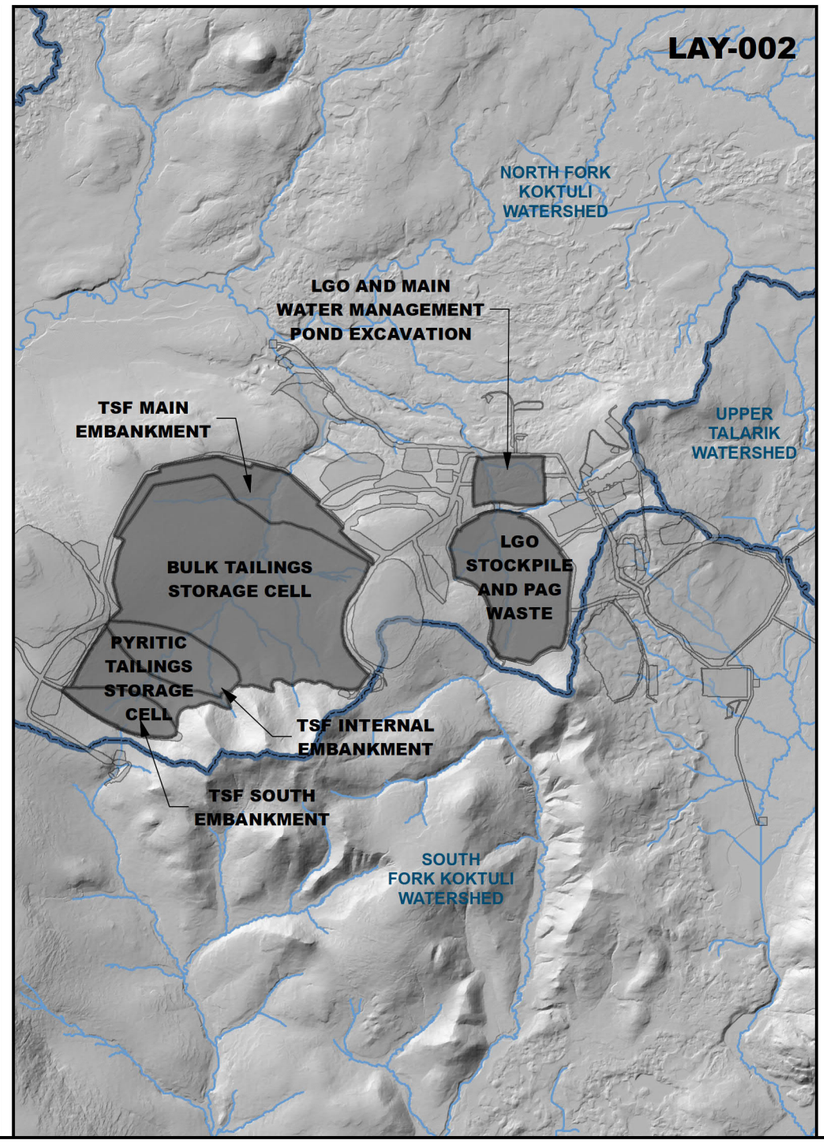
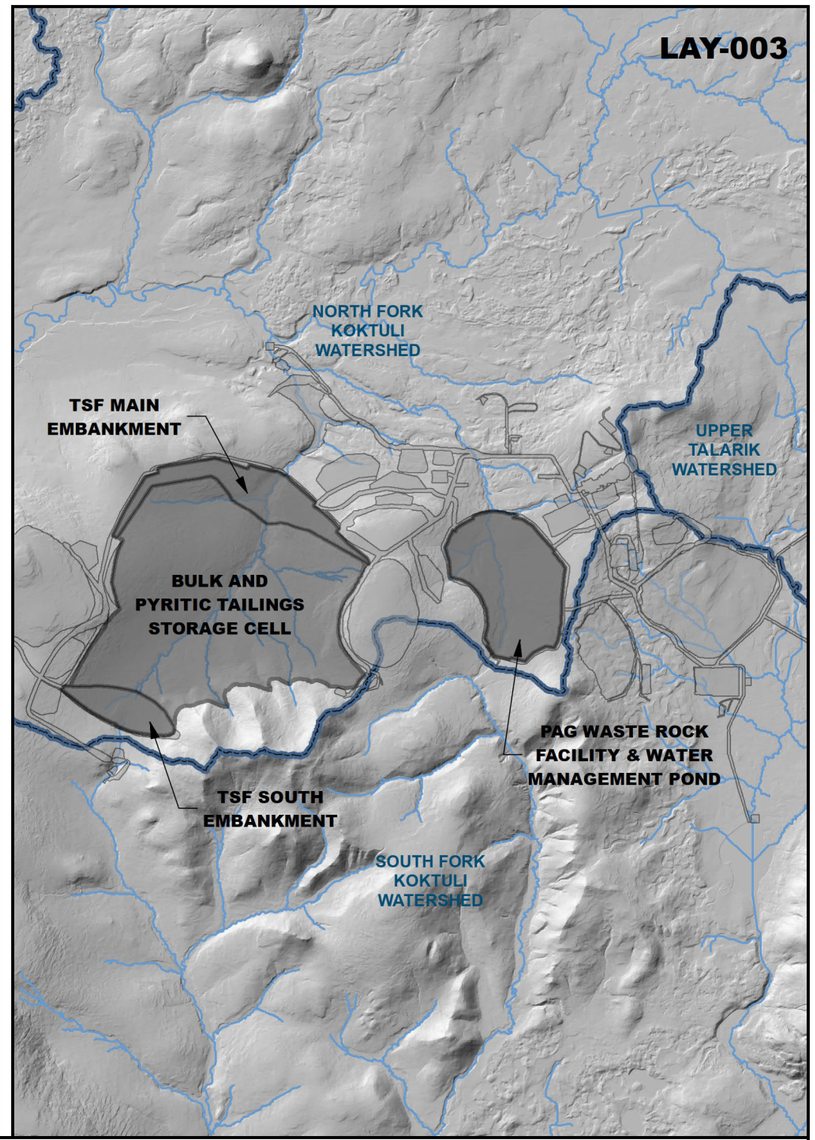
ACCESS OPTIONS

FIGURE B-1







Sources: PLP

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MINE LAYOUT OPTIONS

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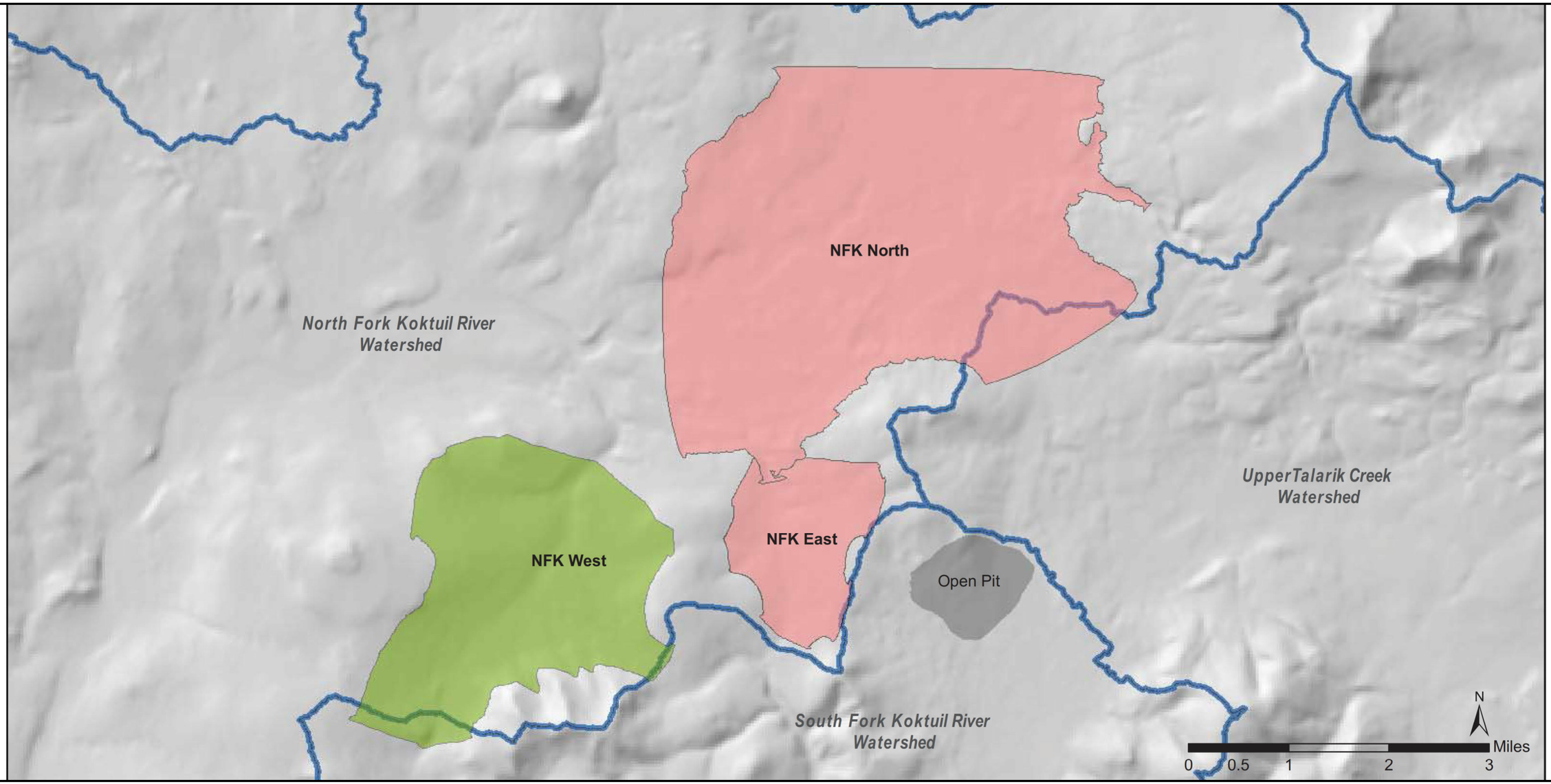
FIGURE B-2



Sources: AECOM; PLP; USGS; ADNR

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TAILINGS STORAGE FACILITY LOCATION OPTIONS

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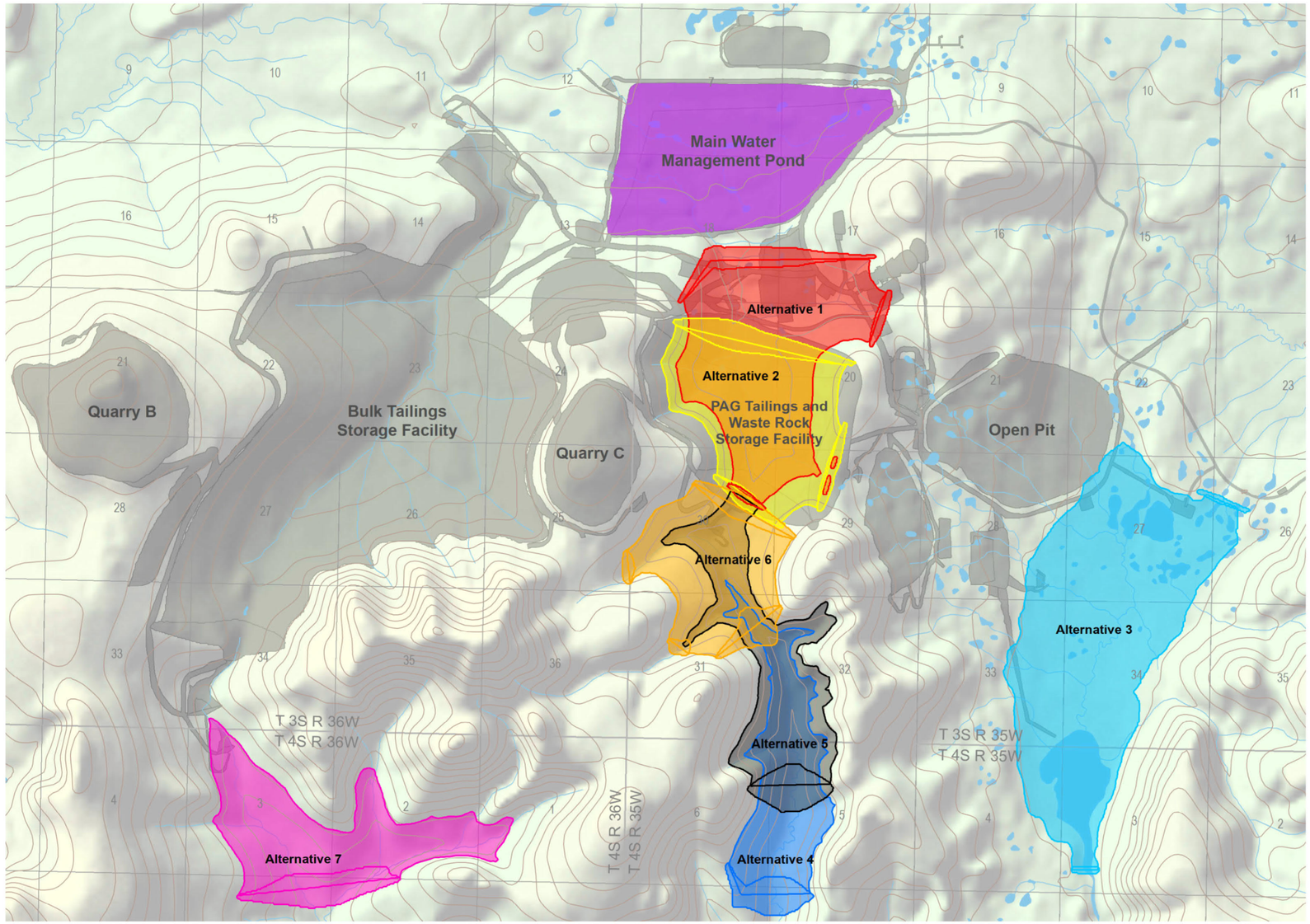
FIGURE B-3



Source: PLP 2019-RFI150

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MAIN WATER MANAGEMENT POND LOCATION OPTIONS

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FIGURE B-4