3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION TO AFFECTED ENVIRONMENT

Chapter 3, Affected Environment, describes the existing environment that would be affected by the proposed project and alternatives under consideration in this Environmental Impact Statement (EIS). This chapter is intended to help readers and agency decision-makers find the information they need to evaluate the affected environment and to understand the impacts and consequences discussed in Chapter 4, Environmental Consequences. Each Chapter 3 section (Section 3.2 through Section 3.26) has a corresponding section in Chapter 4 (Section 4.2 through Section 4.26).

Each resource section in Chapter 3 (Section 3.2 through Section 3.26)[1] discusses:

- The area of analysis (see "Scope of Analysis" below)
- The overall existing condition of the resource, including the natural and physical environment
- The types of potential impacts typically associated with the project, and the alternatives for that resource

The project is discussed in Chapter 3 and Chapter 4 by its four major components. See Chapter 2, Alternatives, for detailed descriptions of differences between alternatives. Note that the action alternatives in Chapter 3 and Chapter 4 are referred to by name without including the word "action" in front. Project components include:

- **Mine Site—**Includes the footprint at the mine site (minus milepost 24-29 of the mine access road, which is included in the transportation corridor).
- **Transportation Corridor—**Includes the footprint of access roads (including milepost 24-29, which overlaps with the mine site footprint), spur roads, ferry terminals, ferry route, and all associated infrastructure. The transportation corridor footprint varies between the action alternatives.
- **Port—**Includes the footprint of the port, dock, all associated infrastructure, navigation aids, and lightering locations. There are two port locations. Alternative 1a and Alternative 1 include the Amakdedori port site. Alternative 2 and Alternative 3 include the Diamond Point port site.
- **Natural Gas Pipeline Corridor—**Includes the pipeline route and all associated infrastructure from the Kenai Peninsula across Cook Inlet to the mine site. The natural gas pipeline corridor footprint varies between the action alternatives.

3.1.1 Other Resources

The National Environmental Policy Act (NEPA) provides the lead agency with discretion to determine which categories of resources merit detailed analysis and which categories do not, based on the scoping process. This determination and impacts to resources that did not warrant detailed analysis are briefly addressed in Section 4.1, Introduction to Environmental Consequences. In addition, although a resource category may not have warranted detailed

[1] Note that in Chapter 3 and Chapter 4, waters of the US (WOUS) as defined under the Clean Water Act and determined to be jurisdictional under US Army Corps of Engineers (USACE) authority (see Appendix J for the Preliminary Jurisdictional Determination from USACE) are discussed collectively with wetlands and other waters; all WOUS, wetlands, or other waters are together termed "wetlands and other waters." The term WOUS may appear in Chapter 3 and Chapter 4 under specific regulatory context.

discussion in a separate section of the EIS, the EIS may still discuss impacts to or aspects of the resource in connection with other resources. This is particularly the case where the resource has relevance to US Army Corps of Engineers (USACE) public interest review. Table 3.1-1 identifies these resource categories and where their environmental consequences are addressed elsewhere in this EIS. Note that affected environment for resources not specifically discussed in Section 3.2 through Section 3.26 is discussed along with environmental consequences in Section 4.1, Introduction to Environmental Consequences.

Chapter 4 also includes Section 4.27, Spill Risk. There is no corresponding section in Chapter 3, because spill risk would be considered an environmental consequence to the resources discussed in Section 3.2 through Section 3.26. Although many environmental protections and precautions would be built into the mine design and operations, including mitigation measures and spill and emergency response plans, concern was expressed about spills during scoping. Detailed analysis on fate and behavior, historical data, existing response capacity, mitigation, and scenarios on diesel spills, natural gas releases from the natural gas pipeline, copper-gold ore concentrate spills, chemical reagent spills, bulk and pyritic tailings release, and untreated contact water release, are analyzed in Section 4.27, Spill Risk.

Table 3.1-1: Chapter 3 and Chapter 4 Section Resource Discussion Location

USACE Public Interest Review Factor	Location
Conservation	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Economics	Section 3.3 and Section 4.3, Needs and Welfare of the People—Socioeconomics
Aesthetics	Section 3.11 and Section 4.11, Aesthetics
General environmental concerns	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Wetlands	Section 3.22 and Section 4.22, Wetlands and Other Waters/Special Aquatic Sites
Historic properties	Section 3.7 and Section 4.7, Cultural Resources*
Fish	Section 3.24 and Section 4.24, Fish Values
Wildlife values	Section 3.23 and Section 4.23, Wildlife Values
Soils	Section 3.14 and Section 4.14, Soils
Flood hazards	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Floodplain values	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Land use inclusive of subsistence subset	Section 3.2 and Section 4.2, Land Ownership, Management, and Use, and Sections 3.9 and 4.9, Subsistence
Navigation	Section 3.12 and Section 4.12, Transportation and Navigation
Shore erosion and accretion	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Recreation	Section 3.5 and Section 4.5, Recreation
Water supply and conservation	Subsection in Section 3.17 and Section 4.17, Groundwater Hydrology
Water quality	Section 3.18 and Section 4.18, Water and Sediment Quality

Table 3.1-1: Chapter 3 and Chapter 4 Section Resource Discussion Location

USACE Public Interest Review Factor	Location
Energy needs	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Safety	Section 3.10 and Section 4.10, Health and Safety
Food and fiber production	Section 3.21 and Section 4.21, Food and Fiber Production
Mineral needs	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Considerations of property ownership	Section 3.2 and Section 4.2, Land Ownership, Management, and Use
Needs and welfare of the people	Section 3.3 and Section 4.3, Needs and Welfare of the People—Socioeconomics
Noise	Section 3.19 and Section 4.19, Noise

Note: This table does not list every resource discussed in Chapter 3 and Chapter 4. Additional sections include: Section 3.4 and Section 4.4, Environmental Justice; Section 3.6 and Section 4.6, Commercial and Recreational Fisheries; Section 3.13 and Section 4.13, Geology; Section 3.15 and Section 4.15, Geohazards; Section 3.20 and Section 4.20, Air Quality; Section 3.25 and Section 4.25, Threatened and Endangered Species; and Section 3.26 and Section 4.26, Vegetation.

*Section 3.8 and Section 4.8 were separate sections in the DEIS titled Historic Properties. Content in Section 3.8 has been combined with Section 3.7 in the Final EIS (FEIS) and titled Cultural Resources. Content in Section 4.8 has been combined with Section 4.7 and titled Cultural Resources.

Source: USACE 2017

3.1.2 Scope of Analysis

3.1.2.1 EIS Analysis Area

The EIS analysis area refers to the entire area of resource analysis, which is specific to each resource discussed in Section 3.2 through Section 3.26. Although the EIS analysis area can be delineated based on the physical footprint of the action alternatives, potential resource impacts are considered in a spatial context appropriate to each resource. The EIS analysis area is defined in each Chapter 3 and Chapter 4 section.

The EIS analysis area is provided to assist USACE in evaluating reasonably foreseeable adverse effects on the human environment per Council on Environmental Quality (CEQ) guidance. The EIS analysis area considers the scope of analysis in the USACE review of all standard public interest review factors in context to determine significance (USACE 2017, Memorandum for Record, Subject: Determination to conduct an environmental impact statement level of analysis for Department of the Army Permit Application POA-2017-271, lead agency determination, and scope of analysis).

In addition, for certain resources, Chapter 3 summarizes supplemental affected environment information downstream of EIS analysis areas to allow impact assessment of spill scenarios in Section 4.27, Spill Risk.

The project area refers to the exact project footprint for each action alternative.

3.1.2.2 Project Location and Watersheds

This section provides a general overview of the proposed project location and the US Geological Survey (USGS) watersheds in the Bristol Bay drainage and the Cook Inlet drainage. Detailed information on the project physical setting is provided in various Chapter 3 resource sections. Hydrology is discussed in Section 3.16, Surface Water Hydrology, and Section 3.24, Fish Values. Detailed information on climate and meteorology is provided in Section 3.20, Air Quality. Detailed

information on land cover is discussed in Section 3.22, Wetlands and Other Waters/Special Aquatic Sites, and Section 3.26, Vegetation.

The proposed mine site is approximately 200 miles southwest of Anchorage. The communities of Iliamna, Newhalen, and Nondalton are each approximately 17 miles from the proposed mine site. The proposed project is in two major watersheds: the Bristol Bay watershed, and the Cook Inlet watershed.

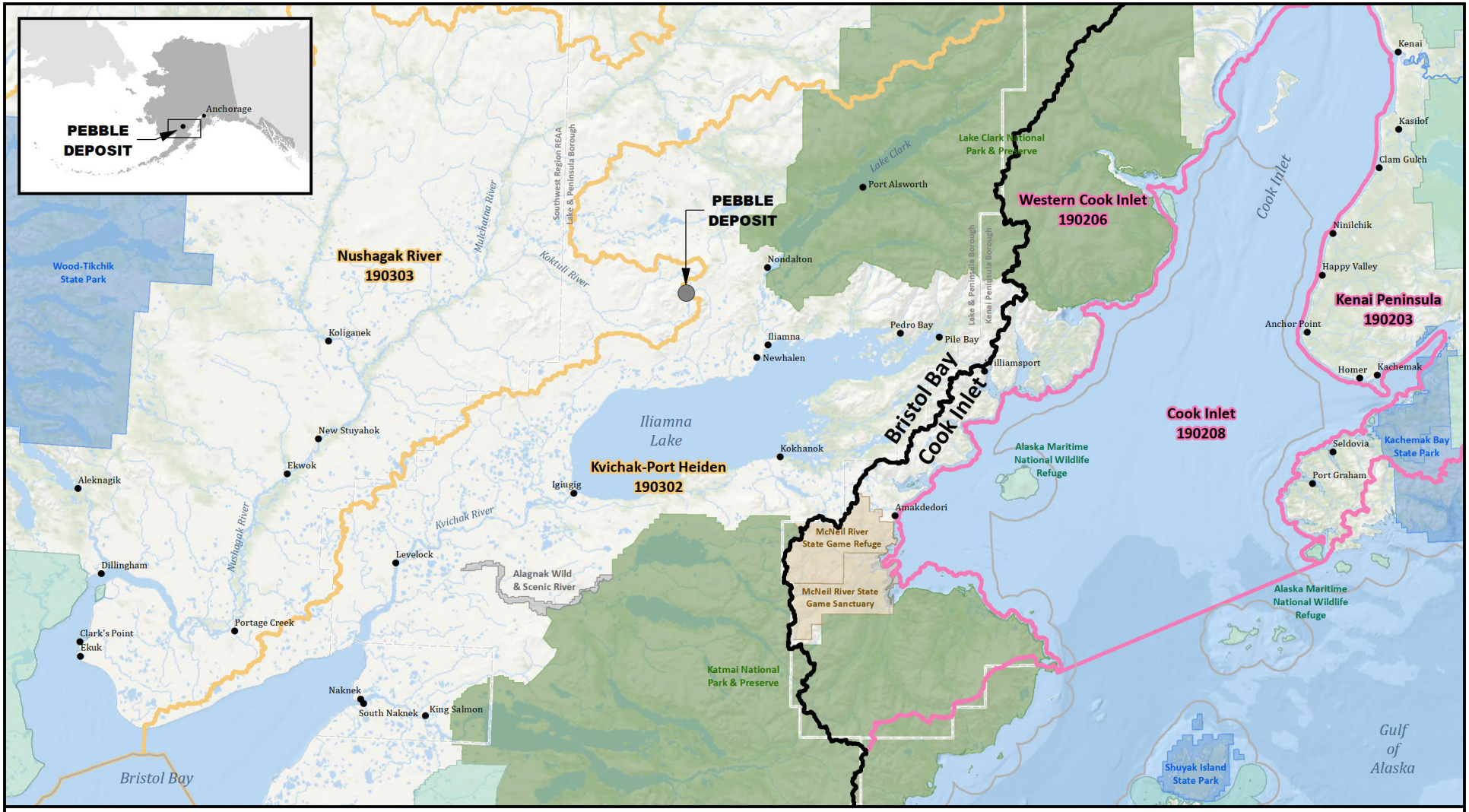
A watershed is defined as the area of land drained by a river and its tributaries. The US is divided and sub-divided by watershed into successively smaller hydrologic unit codes (HUCs) that are arranged or nested in one another. Each hydrologic unit is identified by a unique HUC consisting of two to eight digits, based on the four levels of classification in the hydrologic unit system (USGS 1999). The proposed project is in southwest Alaska in Alaska Region watershed HUC 19 (first-level classification, or HUC 2) in HUC 1903 (Southwest Alaska) and HUC 1902 (Southcentral Alaska) (second-level classification, or HUC 4) (USGS 2018e). The Southwest and Southcentral Alaska HUC 4 level watersheds are further broken down into HUC 6 level watersheds (third-level classifications).

The Bristol Bay watershed and the Cook Inlet watershed are discussed and referred to in Chapter 3. The area of analysis is defined in each resource section in Section 3.2 through Section 3.26 as the EIS analysis area (see definition above). The EIS analysis area may vary from USGS mapping of HUC 6 level watersheds. Figure 3.1-1 depicts the HUC level 6 watersheds that occur in either the Bristol Bay watershed or the Cook Inlet watershed that the proposed project would occur in, for reference.

The Bristol Bay watershed (including the Kvichak and Nushagak rivers) occurs in a portion of HUC 1903. The Bristol Bay watershed includes the proposed mine site and the western portions of the transportation corridor and natural gas pipeline up to where these components cross into HUC 1902. The mine site would be primarily in HUC 190303 (Nushagak River) (third-level classification, or HUC 6). A small portion of the mine site and the HUC 1903 portions of the transportation corridor and natural gas pipeline components (including overland, buried, ferry routes, or subsea routes) would be in HUC 190203 (Kvichak-Port Heiden) (third-level classification, or HUC 6) (USGS 2018e).

The Cook Inlet watershed (including the Cook Inlet) occurs in a portion of HUC 1902. The Cook Inlet watershed includes the proposed port location (for Alternative 1, Amakdedori port site; for Alternative 2 and Alternative 3, Diamond Point port site) and the eastern portions of the transportation corridor and natural gas pipeline corridor that would occur in HUC 1902. The port sites (both Amakdedori port site and Diamond Point port site) would occur in HUC 190206 (Western Cook Inlet) (third-level classification, or HUC 6). The transportation corridor and natural gas pipeline corridor components (including overland routes, undersea routes, and navigation aids) would occur in HUC 190208 (Cook Inlet) (third-level classification, or HUC 6). A portion of the natural gas pipeline component would occur on the Kenai Peninsula at the start of the natural gas pipeline in HUC 190203 (Kenai Peninsula) (third-level classification, or HUC 6).

Figure 3.1-1 depicts the Bristol Bay watershed and the Cook Inlet watershed, delineated by HUC 6 watersheds (USGS 2018e).



Sources: PLP 2018d; ADNR; USGS 2018e

US Army Corps of Engineers

10 0 10 20
Miles

- Pebble Deposit
- Bristol Bay/Cook Inlet Drainage Basin Divide
- Bristol Bay Watershed
- Cook Inlet Watershed
- Borough Boundary
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

BRISTOL BAY AND COOK INLET WATERSHEDS

PEBBLE PROJECT EIS

FIGURE 3.1-1

3.1.3 Resource Interrelationships

Although resources are discussed in Chapter 3, and the impacts on those resources are analyzed in Chapter 4 in discrete sections; these resources are dynamic and interrelated. A change to one resource can have cascading or synergistic impacts to other resources.

The site of the proposed project and the nature of open-pit mining activity would lead to a complex interaction between groundwater, surface water, and a number of water-related resources. The proposed project would also lead to a complex interaction between the above-mentioned water-related resources and fish and aquatic resources. Impacts to water, fish, and wildlife resources could in turn have impacts on subsistence or commercial fishing resources; for example, water quality may affect fish populations, which in turn may influence subsistence or commercial fishing harvests, and can have implications for other human outcomes such as health and socioeconomics. Impacts described in one section may depend on the analysis from another section. During the writing process, preparers collaborated by sharing data and discussing interrelated aspects of the analyses to better capture the interrelated nature of environmental resources in both Chapter 3 and Chapter 4.

3.1.4 Traditional Ecological Knowledge

The people of the region have lived there for centuries and have developed a unique culture that evolved from the environment. Their knowledge base has evolved through a system of learned experience, through direct observations, and through trial and error. In recent decades, Alaska Natives have been promoting their complex bodies of knowledge and understanding to be recognized by state and federal agencies regarding climate change, flooding and erosion, surface/groundwater hydrology, landscapes, fish and wildlife life histories and migratory patterns, and seasonal distributions/use of subsistence resources. This traditional ecological knowledge (TEK) is just as important as modern means of transportation and hunting technology in supporting safe and efficient subsistence harvest activities. TEK is a culturally significant accumulation of data acquired over thousands of years, with a vast depth and breadth of knowledge.

USACE has taken the following approach to incorporating TEK into this EIS:

- Reviewing scoping comments for relevant TEK.
- Reviewing comments on the Draft EIS (DEIS) for relevant TEK.
- Reviewing pertinent sections of the Environmental Protection Agency (EPA) Watershed Assessment (An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska, EPA 2014).
- Reviewing pertinent sections of the Pebble Environmental Baseline Document (EBD) Chapter 23, Subsistence (SRB&A 2011b) to identify any relevant material that can be considered TEK and attributed to an individual or a tribal organization.
- Reviewing Alaska Department of Fish and Game (ADF&G) technical papers that incorporate traditional knowledge into the methodology.
- Reviewing meeting notes from government-to-government meetings for relevant TEK, as appropriate.
- Reviewing meeting notes from National Historic Preservation Act Section 106 consultations.

Specific topics that USACE considered for inclusion as TEK include:

- Information on surface/groundwater hydrology and water quality in the project area (including areas with a high water table and variations in stream flow and underlying causes, timing of breakup, and freeze-up, and areas where water quality might be affected by natural and human-made causes).
- Information on location, frequency, and trends with regard to natural hazards such as flooding, erosion, river and lake ice, avalanches, and rockslides.
- Observations of trends, patterns, or changes in weather and climate, including storms, rainfall, and snowpack.
- Information on fish, wildlife, birds, and marine mammals in the EIS analysis area, including distribution and seasonal presence, population trends, migration patterns, habitat areas, behavior, and changes over time.
- Information on the vegetation in the EIS analysis area, including species used for subsistence, areas of occurrence, and changes over time.
- Important areas, access routes, and seasons of subsistence activity, use and sharing of subsistence resources, and changes over time.
- Culturally important areas in the project area from a historic and contemporary perspective.
- Areas being used by local guides and commercial operators for sport fishing, hunting, and wildlife viewing that could be directly or indirectly impacted by the project, and changes to those areas over time.
- Information important to navigation in the project area.
- Information on where residents are collecting surface water for residential use.

TEK has been incorporated into relevant resource sections. Collected TEK information can be found in Appendix K3.1.

3.1.5 Climate Change

Climate change has the potential to result in environmental impacts relevant to the proposed project and its alternatives in three primary ways (AECOM 2018p):

1. Effects of the project on climate change. This category addresses the effect of the proposed action on climate change as indicated by greenhouse gas (GHG) emissions, per the CEQ 2014 Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and Climate Change in NEPA Reviews (CEQ 2014), per rescission of the 2016 Final Guidance on Greenhouse Gases and Climate Change.
2. Effects of climate change on the project area. This category addresses the implications of climate change for the environmental effects of the proposed action; or in other words, examines the impacts of climate change on a proposed action that could affect sensitive populations or environmental resources (CEQ 2014). Climate change as a cumulative effect is considered under this category, per CEQ 1997 Considering Cumulative Effects under the NEPA (CEQ 1997b) and CEQ 2014.
3. Effects of climate change on proposed project infrastructure. This category addresses the effects on the proposed project infrastructure from climate change, and considers accounting for potential climate change effects on a proposed action over the course of its anticipated useful life, especially in areas that may be vulnerable to specific effects of climate change, per CEQ 2014.

This EIS addresses these three ways in the following locations:

1. Project-caused GHG emissions are discussed and analyzed in Section 4.20, Air Quality.
2. Climate change trends are integrated into discussion if appropriate to the resource in Section 3.2 through Section 3.26 (Affected Environment). Climate change as a cumulative effect is discussed in a subsection if appropriate to the resource in Section 4.2 through Section 4.27 (Environmental Consequences).
3. Climate change effects on proposed project infrastructure are addressed if appropriate to the resource in Section 4.2 through Section 4.27 (Environmental Consequences).

3.1.6 Incomplete and Unavailable Information

The process of data gap analysis for the DEIS was detailed in a technical memorandum (AECOM 2018q, Pebble Project—Final Data Gap Analysis). For each data gap, the process of applying CEQ guidance questions to determine if data were required for analysis was described. The CEQ regulations in 40 Code of Federal Regulations (CFR) Part 1502.22 provide direction on how to address incomplete information, which are referred to as "data gaps" in the memo. These specific regulations need to be viewed in concert with other CEQ NEPA regulations; including, for example, 40 CFR Part 1502.24, which covers methodology and scientific accuracy.

The CEQ regulations make it clear that when there is incomplete or unavailable information for the evaluation of reasonably foreseeable significant adverse effects, the federal agencies "shall always make clear that such information is lacking."

The CEQ regulations at 40 CFR Part 1502.22(a) instruct that if incomplete information: 1) is relevant to reasonably foreseeable significant adverse impacts; 2) is essential to a reasoned choice among alternatives; and 3) the overall costs of obtaining it are not exorbitant, the agency shall include the information in the EIS. This documentation complies with 40 CFR Part 1502.22(b)(1-4) requirements that the agency shall include in the EIS:

(1) A statement that such information is incomplete or unavailable.

(2) A statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment.

(3) A summary of existing credible scientific evidence that is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment.

(4) USACE's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

Comments received during scoping and during the public comment period for the DEIS raised concerns that some data are not current because of the age of data or studies, or because significant Pebble Limited Partnership (PLP) data collection efforts were conducted several years ago. Data gap screening information for the Final EIS (FEIS) is provided in Table 3.1-2. The FEIS data gap analysis considers the age of the data, the sufficiency of the data in terms of quality and quantity, and whether these factors meaningfully affect the evaluation of impacts.

Table 3.1-2: Data Gaps Screening

Missing Information Screening Questions (40 CFR Part 1502.22)	Data Gap and Responses
Missing Information Screening Questions (40 CFR Part 1502.22)	**Data Gap: Subsistence** Comprehensive subsistence data collected from 2004 through 2011 by SRB&A and the ADF&G Division of Subsistence are available in the EBDs and as part of the ADF&G Division of Subsistence Technical Paper Series. Data collected by ADF&G Division of Subsistence for two Kenai Peninsula communities for 1998 and 2014 are also included in the EIS. However, more recent comprehensive subsistence data for these communities have not been collected and made available. Although subsistence data coverage is extensive for the Bristol Bay drainage, unavailable, older, or limited data sets for project area communities are acknowledged in the "Affected Environment" section (Chapter 3) and Appendix K (Technical Appendices) as known data gaps.
Essential to a reasoned choice among the alternatives?	It is common that current and site-specific information on subsistence use activities and areas is not available for a proposed project during NEPA compliance. However, data available in the Pebble Project EBDs and from the ADF&G provide fairly comprehensive coverage of the proposed mine site locations and transportation routes. Changes may occur in the area and intensity of subsistence activity as the location of resources changes and as needs change, but such change typically occurs in a larger area historically used by a community, and is documented in available information. In addition, there is anecdotal information from scoping comments regarding use of some areas, such as in the vicinity of the Amakdedori port site. Through relying on the existing data sets, considering the anecdotal information from scoping comments, and allowing for some evolution of use areas and intensity, the available information is adequate for assessing the potential impacts of the proposed action alternatives and variants.
How could missing information be acquired?	PLP would need to hire a contractor that specializes in subsistence study, and state or federal agencies would need to allocate funding and staff members for study. Funds would need to cover travel, lodging, and other expenses for travel to approximately 19 communities.
What would it take to acquire the missing information?	The team, consisting of PLP's contractor and state or federal staff, would need to travel to approximately 19 communities multiple times to hold scoping meetings; conduct systematic household surveys and mapping interviews with as many year-round households as possible; and hold follow-up meetings to review and discuss the results. The data would then need to be mapped, synthesized, and analyzed. In total, it could take 2 to 6 years to complete.
Relevance to reasonably foreseeable significant adverse impacts	Updated information would provide a more current picture of subsistence use in the immediate vicinity of the mine site, transportation corridor, port, and natural gas pipeline facilities. However, based on the existing information, the analysis of potential impacts assumes that subsistence harvest activities are occurring in these areas, and takes into account the previously documented areas of highest overlapping use, and the historical areas of subsistence harvest and access.

Table 3.1-2: Data Gaps Screening

Missing Information Screening Questions (40 CFR Part 1502.22)	Data Gap and Responses
Existing credible scientific evidence	Data collected from 2004 through 2011 by SRB&A and the ADF&G Division of Subsistence for the Applicant are available in the EBDs and as part of the ADF&G Division of Subsistence Technical Paper Series. Data collection coverage includes 17 Bristol Bay drainage communities. Data collected by ADF&G Division of Subsistence for two Kenai Peninsula communities for 1998 and 2014 are also included in the EIS. Although the SRB&A and ADF&G data set for the Bristol Bay drainage communities is now 10 to 15 years old, that is not atypical for available data in much of the state. In addition, the methodology used to identify areas of overlapping subsistence use and document the areas historically used for subsistence harvest by resource for individual communities allows making conservative assumptions for potential impacts that could occur over time.
USACE evaluation of impacts based on selected approach	The EIS acknowledges this data gap for subsistence harvest use areas and rates of harvest/sharing. Although harvest areas and rates change over time, the EIS assumes that they would still follow historical trends, or may be similar enough to adequately address possible impacts.

Notes:
ADF&G = Alaska Department of Fish and Game
EBD = Environmental Baseline Document
EIS = Environmental Impact Statement
NEPA = National Environmental Policy Act
SRB&A = Stephen R. Braund and Associates

Source: AECOM 2018q; Comment Analysis Report, (Appendix D)