4.25 THREATENED AND ENDANGERED SPECIES

Under the federal Endangered Species Act (ESA) of 1973, applicants for projects requiring federal agency action that could adversely affect threatened and endangered species (TES) are required to consult with and mitigate impacts in consultation with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Adverse impacts are defined as "take" (defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct"), which is prohibited except as authorized through consultation with USFWS and NMFS. The USFWS or NMFS may issue an Incidental Take Statement under Section 7 or Section 10 of the ESA, depending on whether there is a federal nexus (federal permit required, or funding involved). Because the US Army Corps of Engineers (USACE) is the lead federal agency for the National Environmental Policy Act (NEPA) review of the Applicant's permit application, the agency is required to consider the effects that a federal action may have on all listed species in the Environmental Impact Statement (EIS) analysis area. To analyze the potential effects that a federal action may have on a listed species, separate biological assessments for species under the jurisdiction of the USFWS and NMFS have been prepared. These biological assessments are included as Appendix G and Appendix H, and are referenced in this section because they provide additional details and analyses specifically for Alternative 3.

All marine mammals are also protected under the Marine Mammal Protection Act (MMPA). Under the 1994 Amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment), or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns (Level B harassment). The two levels are discussed in terms of impacts in this section as they apply to TES. Non-TES marine mammals are discussed separately in Section 3.23, Wildlife Values; and Section 4.23, Wildlife Values. Additional information on the ESA and MMPA is provided in Appendix E, Laws, Permits, Approvals, and Consultations Required. Although MMPA permitting would be necessary to construct and operate the project, it is beyond the scope of this EIS to discuss whether the submission of an application for Incidental Take Authorizations or regulations under the MMPA would result in issuance of such an authorization.

This section details the potential impacts of the project alternatives and their variants on TES in the EIS analysis area, which are detailed in Section 3.25, Threatened and Endangered Species. TES considered in this analysis include beluga whale (*Delphinapterus leucas*, Cook Inlet stock), humpback whale (*Megaptera novaeangliae*, western North Pacific Distinct Population Segment [DPS], and Mexico DPS), fin whale (*Balaenoptera physalus*, northeast Pacific stock), blue whale (*Balaenoptera musculus*, North Pacific Stock), sperm whale (*Physeter macrocephalus*, North Pacific Stock), sei whale (*Balaenoptera borealis*, North Pacific Stock), gray whale (*Eschrichtius robustus*, Western North Pacific DPS), North Pacific right whale (*Eubalaena japonica*, Eastern North Pacific Stock), Steller sea lion (*Eumetopias jubatus*, western DPS), northern sea otter (*Enhydra lutris kenyoni*, southwest Alaska DPS), Steller's eider (*Polysticta stelleri*, Alaska breeding population), and short-tailed albatross (*Phoebastria albatrus*; worldwide population). Furthermore, federally designated and proposed critical habitat occurs in the analysis area for Cook Inlet beluga whale, humpback whale, northern sea otter, and Steller sea lion.

4.25.1 Summary of Key Issues

Table 4.25-1 details the key issues for TES across all alternatives. Because potential impacts to TES would be restricted to the marine environment, all terrestrial components of the project (including the mine site and overland portions of the transportation corridor and natural gas pipeline) are considered to have no direct impact on TES. Quantified acreages of impacted habitat are presented in Table 4.25-2, and are specific for marine components of the project only.

Table 4.25-1: Summary of Key Issues for TES

Impact Causing Project Component	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Port				
Behavioral Changes	Physical presence of vessels (for the life of the project) and aircraft (primarily during construction, but may also occur throughout the life of the project) may temporarily displace marine TES. Marine mammals are anticipated to move away (swim or dive) from project equipment and vessels during construction and operations. Eiders may swim, dive, or fly away from approaching vessels and aircraft (Ward and Stehn 1989; Frimer 1994).		Same as Alternative 1a and Alternative 1; however, there would be no airport at Diamond Point port, and aircraft would land at the existing airstrip inland at Pedro Bay. Therefore, there would be no impacts to TES from project-related flights into and out of Pedro Bay. There would be a greater potential for Steller's eider disturbance in Iliamna and Iniskin bays because they occur in greater numbers in these protected bays compared with Amakdedori.	
Injury and Mortality	There is a potential for TES to collide with port infrastructure (including lights on the causeway and lighted navigation buoys) and vessels. Steller's eiders have a potential to collide with the communication tower at the on-land portion of the port.			
	Construction of the caisson dock would reduce underwater noise impacts to TES, with only a potential for Level B acoustic harassment from construction.	Depending on the dock variant selected, underwater noise could exceed injury (Level A) and disturbance (Level B) acoustic harassment thresholds during construction, as defined by NMFS and USFWS.		Construction of the caisson dock would reduce underwater noise impacts to TES, with only a potential for Level B acoustic harassment from construction.
Habitat Changes	Both permanent and temporary impacts to habitat for TES would vary depending on the dock variant selected. Table 4.25-2 details the habitat acreages for each alternative and variant for the different TES critical habitats that would be impacted.		Similar to Alternative 1a and Alternative 1, but dredging of a navigation channel to access the port would be required, then maintenance dredging approximately every 5 years would continue to disturb the habitat in the navigation channel. Construction of the port access road would involve impacts to the intertidal zone from the road at Diamond Point.	
Lightering Locations				
Behavioral Changes	Avoidance of lightering locations and the immediate vicinity while vessels are moored and loading concentrate for all TES. This would last for the life of the project.			Similar to other alternatives, but only one lightering location is proposed in Iniskin Bay.
Injury and Mortality	Potential for collision for all TES with mooring buoys, anchor chains, and vessels. This would last for the life of the project.			Similar to other alternatives, but reduced potential due to only one lightering location in Iniskin Bay.
Habitat Changes	Construction would result in the permanent loss of 0.15 acre of benthic marine habitat (inclusive of both lightering locations regardless of alternative). This would last for the life of the project.			Loss of 0.07 acre of benthic marine habitat from anchors for one lightering location.

Table 4.25-1: Summary of Key Issues for TES

Impact Causing Project Component	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Natural Gas Pipeline				
Behavioral Changes	Physical presence of vessels (during pipeline and adjacent fiber-optic cable installation and maintenance) may temporarily displace marine TES. This would last during one June-to-August construction period and potential for behavioral changes would be similar regardless of the alternative.			
Injury and Mortality	Underwater noise (with the dominant noise source from vessel cavitation noise) may exceed disturbance (Level B) acoustic harassment thresholds, but not injury (Level A) acoustic harassment thresholds, during pipeline and fiber-optic cable installation as defined by NMFS and USFWS. The noise from vessel cavitation would be greater than potential noise levels generated by various dredging technologies. Specific underwater noise impacts from various dredging technologies are detailed in Table K4.25-3 in Appendix K4.25, Threatened and Endangered Species. There is a potential for vessels to collide with TES during construction. This would last during one June-to-August construction period and the potential for injury and mortality would be similar regardless of the alternative.			
Habitat Changes	There would be temporary disturbance to habitat for one summer period while the natural gas pipeline and adjacent fiber-optic cable are trenched into Cook Inlet. This would result in potential disturbance to the seafloor and benthic marine environment, with the acreage of disturbance varying by alternative, as detailed below in Table 4.25-2. The width of the corridor would vary depending on the depth of Cook Inlet and the amount of seafloor disturbance from trenching or placing the pipeline on top of the seafloor (which would vary by alternative). There would be additional temporary seafloor disturbance from moving the station holding anchors for the pipelay barge during trenching of the pipeline. The station holding anchors would extend out on either side of the pipeline centerline and vary in width from 650 feet to 4,101 feet (up to a maximum diameter of 8,202 feet wide). This width would vary with the depth of Cook Inlet where the pipeline is trenched. In addition, not all habitat within the maximum width of 8,202 feet would be disturbed. There would be increased turbidity on the seafloor during trenching and while the station holding anchors are moved. The trench for the pipeline is expected to fill in from tidal flows. This would last during one June-to-August construction period, and potentially longer depending on the recovery time for benthic marine species that were disturbed during trenching.			
Vessel Routes				
Behavioral Changes	Physical presence of vessels may temporarily displace marine TES. This would last for the life of the project, but to a lesser extent after post-closure due to reduced need for barging. The potential for behavioral changes would be similar regardless of the alternative.			
Injury and Mortality	Underwater noise (with the dominant noise source from vessel cavitation noise) may exceed disturbance (Level B) acoustic harassment thresholds, but not injury (Level A) acoustic harassment thresholds, from vessel traffic as defined by NMFS and USFWS. There is a potential for vessels to collide with TES during project construction phases, with an increase in potential during summer, when whale species are more common in the analysis area. This would last for the life of the project, but to a lesser extent after post-closure due to reduced need for barging. The potential for injury and mortality would be similar regardless of the alternative.			
Habitat Changes	There are no habitat changes anticipated from use of vessel routes. Although vessel routes go through critical habitat for several species (Cook Inlet beluga whale, humpback whale, Steller sea lion, and northern sea otter), project-related vessels would be traveling slowly (less than 10 knots) through critical habitat for Cook Inlet beluga whale and northern sea otter in lower Cook Inlet. There are no anticipated habitat changes to proposed critical habitat for humpback whale. Vessel routes would pass through the 20-nautical-mile buffer around Steller sea lion haulouts and rookeries. However, the closest that vessel traffic would pass by a major haulout or rookery is approximately 5 nautical miles.			

Notes:

NMFS = National Marine Fisheries Service
TES = Threatened and Endangered Species
USFWS = US Fish and Wildlife Service

Table 4.25-2: Summary of Physical Impact Acreages to TES Critical Habitat

	Alternative 1a		Alternative 1 and Variants			Alternative 2 and Variants			Alternative 3 and Variant	
Species Critical Habitat	Caisson Dock[1]	Natural Gas Pipeline Corridor[2]	Earthen Causeway/ Sheet Pile Dock[1]	Pile-Supported Dock[1]	Natural Gas Pipeline Corridor[2]	Earthen Causeway/ Sheet Pile Dock,[1] Port Access Road, and Dredge Area	Pile-Supported Dock,[1] Port Access Road, and Dredge Area	Natural Gas Pipeline Corridor[2]	Caisson Dock,[1] Port Access Road and Dredge Area	Natural Gas Pipeline Corridor[2]
Beluga Whale	3.5 acres	33.8 acres	10.7 acres	3.1 acres	33.8 acres	95.3 acres (inclusive of 57.7 acres from the temporary dredge area)	93.1 acres (inclusive of 57.7 acres from the temporary dredge area)	126 acres	100.6 acres[3] (inclusive of 75.7 acres from the temporary dredge area)	118.7 acres
Humpback Whale (proposed habitat for Mexico DPS)	0 acres	554 acres	0 acres	0 acres	554 acres	0 acres	0 acres	496 acres	0 acres	496 acres
Northern Sea Otter[4]	3.5 acres	76.2 acres	10.7 acres	3.1 acres	76.2 acres	95.3 acres (inclusive of 57.7 acres from the permanent dredge area)	93.1 acres (inclusive of 57.7 acres from the permanent dredge area)	171 acres	100.6 acres[3] (inclusive of 75.7 acres from the permanent dredge area)	164.8 acres

Notes:
[1] All dock footprints are considered permanent impacts and acreages represent the entire above-water dock footprint, which includes all underwater dock support structures. The Alternative 2 and Alternative 3 footprints include maintenance dredge areas, which are considered temporary impacts for beluga whales (because they do not forage heavily on benthic prey), but are considered permanent impacts for northern sea otters (because they forage in the benthic environment). There is an additional 30-foot temporary construction buffer around all in-water project footprints (which is not included in the acreages listed above), with specific acreages detailed by project component for Alternative 3 in Tables 12 and 11 in Appendix G, ESA Biological Assessment—USFWS; and Appendix H, ESA Biological Assessment—NMFS, respectively.
[2] The natural gas pipeline corridor footprints are considered temporary impacts and include the fiber-optic cable route. If the fiber-optic cable is not installed coincidentally with the natural gas pipeline corridor, there would be repeated habitat disturbance during installation for the cable following the natural gas pipeline corridor.
[3] These acreages are based on the concentrate pipeline variant port design. The base case for Alternative 3 would have 0.03 acre less due to no concentrate bulk loader attached to the dock.
[4] Although no critical habitat for Steller sea lion or Steller's eider occurs in Iliamna, Iniskin, or Kamishak bays, loss of foraging habitat would occur and acreages of habitat impacted are assumed to be similar to northern sea otter.
DPS = Distinct Population Segment TES = Threatened and Endangered Species

The magnitude and extent of physical impacts to TES and their critical habitats would vary depending on the alternative and dock design selected (Table 4.25-2). Table 4.25-2 does not include the area of ensonification that would result during the various project activities, but focuses on physical impacts to TES critical habitat. Although no critical habitat for Steller sea lion or Steller's eider occurs in Iliamna, Iniskin, or Kamishak bays, loss of foraging habitat would occur and acreages of habitat impacted are assumed to be similar to northern sea otter The natural gas pipeline and fiber optic cable corridor is shorter for Alternative 2 and Alternative 3 (and therefore, less habitat is disturbed during installation); however the need to dredge a navigation channel and then maintain the depth of the dredged navigation channel is a greater physical impact to the benthic marine environment compared with Alternative 1a and Alternative 1. In terms of noise impacts, the caisson dock under Alternative 1a and Alternative 3 would result in the lowest magnitude of noise impacts to TES, because no sheet or pile-driving would be necessary. Therefore, underwater noise impacts would be greatly reduced when compared with the Earthen Causeway Dock and Pile-Supported Dock variants. A port at Amakdedori would generally have lower impacts to TES because there are fewer TES at Amakdedori compared to Iliamna Bay. The primary lightering location for Alternative 1a and Alternative 1 would have a lower magnitude of impacts to TES compared to the primary lightering location under Alternative 2 and the one lightering location under Alternative 3 (in Iniskin Bay). Regardless of alternative, the extent of impacts would encompass the port, lightering locations, and shipping routes in the analysis area. The duration of impacts would differ between construction and operations, but the main impacts would be the permanent footprint of the port and lightering locations and increase in vessel traffic during operations that would last for the life of the project.

4.25.2 Analysis Area

The EIS analysis area is composed of all components of the project, including the mine site, transportation, and natural gas pipeline corridors, port, lightering locations, and natural gas compressor station on the Kenai Peninsula. Specifically, for TES, the analysis area focuses on the marine components of the project in Cook Inlet, the Gulf of Alaska, along the Aleutian Islands, and the Bering Sea, because no TES have been documented in the terrestrial portions of the project. Terrestrial components of the project that include the mine site, ferry terminals, terrestrial portions of the transportation and natural gas pipeline corridors, and compressor station on the Kenai Peninsula are not discussed below because TES do not have ranges that overlap these terrestrial areas. Only marine components of the project in lower Cook Inlet and the proposed vessel routes through the Gulf of Alaska, along the Aleutian Islands, and through the Bering Sea out to the exclusive economic zone are included in the analysis area. In particular, no TES are known to occur in the vicinity of the Newhalen, Gibraltar, or Iliamna River bridge crossings (including all the variants) for the transportation and natural gas pipeline corridors; therefore, these river crossings will not be discussed further for TES.

The analysis area is defined in Section 3.25, Threatened and Endangered Species, and is briefly reiterated here as it relates to project impacts. The analysis area encompasses Iliamna, Iniskin, Cottonwood, Kamishak, and several other adjacent bays, and includes all marine project components during all phases of the project (construction, operations, and closure) regardless of the alternative or variant. This includes installation (including noise from various potential dredge technologies) of the natural gas pipeline, projected flight paths into and out of the proposed airstrip at Amakdedori, and project-related vessel traffic between the port and lightering locations. The analysis area was also designed to encompass impacts of project-related vessel traffic, including potential vessel routes in Cook Inlet and beyond.

Proposed vessel routes include waters of lower Cook Inlet and marine areas crossed by marine transport vessels, including concentrate bulk carriers, from Cook Inlet through Shelikof Strait, and

through the Aleutian Islands out to the limits of the exclusive economic zone; marine line haul barges from Cook Inlet transiting to West Coast ports through the Gulf of Alaska out to the limits of the exclusive economic zone; and potential fuel barge traffic between the project port and Nikiski Port. Each vessel route was designed as a 4-nautical-mile-wide corridor, plus a 1.2-nautical-mile general vessel noise ensonified area on either side of the corridor, based on Warner et al. (2014), to account for possible noise effects to marine mammals, or a total vessel corridor width of 6.4 nautical miles.

Because the EIS analysis area was determined based on the extent of potential impacts from the project, one of the largest potential impacts is the area of ensonification during project activities, including dredging during installation of the natural gas pipeline and from project-related vessel traffic, which are detailed below under impacts from underwater noise. Specific underwater noise impacts from various dredging technologies are detailed in Table K4.25-3.

4.25.2.1 Impacts Analysis

Impacts are assessed by four factors: magnitude, extent, duration, and likelihood of impacts to TES and/or TES habitat (including federally designated critical habitat). The magnitude of impact from the project depends on the specific species' sensitivity to the disturbance and the type of disturbance; the extent and duration of impacts depends on the location and season in which the disturbance occurs (e.g., during whale migrations), and the timeframe the project is in operation. The duration of impacts also depends on whether the impact is considered temporary or permanent. Generally, any project components that would remain in place for the life of the project (20 years of operations) and potentially beyond are considered permanent. For example, the placement of structures in Cook Inlet associated with the port are considered permanent impacts. Impacts with a temporary duration include those that would be allowed to naturally recover after the initial disturbance or are buried beneath the ground or Cook Inlet sea floor, such as the footprint of the natural gas pipeline. The likelihood of impact occurring is based on whether or not the project is permitted, and depends on the alternative (and variant, if applicable) selected. It is assumed that if the project is permitted, there is a likelihood that impacts are possible, depending on incorporation of impact minimization measures. Therefore, each impact section discusses the magnitude, duration, and extent of the potential impact on the species, and the likelihood is assumed if the project is permitted.

Potential direct and indirect impacts on TES include:

- Behavioral disturbance, including:
  - Noise (causing stress and auditory masking) as defined by the NMFS acoustic harassment thresholds outlined in Table K4.25-1: Summary of NMFS Acoustic Thresholds (Level A [injury] and B [disturbance])
  - Presence of humans, vehicles and equipment, vessels, and aircraft (causing stress and auditory masking)
- Injury and mortality (from collisions with structures [including port facilities], vessels, or other marine components, and entanglement)
- Habitat changes (such as loss of and disturbance to prey resources and foraging habitat), including potential invasions of marine invasive species (discussed in Section 4.26, Vegetation)

Scoping comments expressed concern that the port site at Amakdedori is in designated critical habitat for Cook Inlet beluga whales and northern sea otters. Comments also noted that northern sea otters and Steller's eiders occur in the waters of Cook Inlet and Kamishak Bay. These

concerns and comments are addressed in the impact discussions below based on the alternative considered and species potentially impacted.

Additional concerns that have been expressed include the potential for impacts to marine mammals from project-related underwater noise sources. Underwater noise that could potentially impact marine mammals is regulated by NMFS for industrial noise sources such as pile-driving (NMFS 2018b). This EIS does not provide a detailed calculation of acoustical thresholds of specific project components under the alternatives. It also does not provide a detailed assessment of estimated numbers of marine mammal "take" through noise disturbance and harassment. This detailed information would be analyzed further in a MMPA authorization request to the regulatory agencies to meet Level A and B guidelines. Although USFWS uses the NMFS acoustic guidelines for estimates of take attributable to activities that produce underwater noise, they also use behavioral criteria for take estimation. To issue an Incidental Harassment Authorization (IHA) under Section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence use. NMFS strives to develop mitigation and monitoring measures that would minimize the severity of such taking to the extent practicable. Mitigation is mainly focused on close-range injury effects, defined as the onset of permanent threshold shifts (PTS) and temporary threshold shifts (TTS) in marine mammal hearing (NMFS 2018b). As detailed in the biological assessments (Appendices G and H), Pebble Limited Partnership (PLP) would develop a Marine Mammal Monitoring and Mitigation Plan (4MP) in association with an IHA to apply mitigation measures to reduce impacts to whales and pinnipeds. The plan would include employing protected species observers (PSOs) to monitor these areas and initiate activity shutdown as needed to prevent Level A and minimize Level B harassment of marine mammals. In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, two primary factors are considered: 1) the manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat; and 2) the practicability of the measures for Applicant implementation, which may consider such things as cost, impact on operations, and other factors. As mentioned previously, it is beyond the scope of this EIS to discuss whether the submission of an application for IHA or Regulations under the MMPA would result in issuance of such an authorization.

Potential impacts to TES, their prey, and habitats from various spill scenarios are not discussed in this section, but are detailed in Section 4.27, Spill Risk. This includes potential impacts to TES, prey species (e.g., fish, invertebrates, benthic organisms) and their habitats. Potential impacts on water quality are detailed in Section 4.18, Water and Sediment Quality, and all water released back into the environment (including wastewater) would meet or exceed water quality standards. Additional information on impacts to water quality from potential unintended releases and spills is detailed in Section 4.27, Spill Risk.

4.25.2.2 Project Variants

The different alternative variants that are considered outside of Cook Inlet (Kokhanok East Ferry Terminal Variant, Summer-Only Ferry Operations Variant, and Newhalen River North Crossing Variant) would not change the overall impact to TES. Specifically, under the Summer-Only Ferry Operations Variants for Alternative 1 and Alternative 2, there would be no change to the year-round concentrate lightering schedule from the ports to the lightering locations, and therefore no change in impacts to TES in Cook Inlet. The only variants that would impact TES in Cook Inlet

are the Pile-Supported Dock Variant (under Alternative 1 and Alternative 2) and the Concentrate Pipeline Variant (for Alternative 3). Because this section is organized by species rather than by component, separate variant subheadings are not included (this structure differs from other sections of Chapter 4, Environmental Consequences). Discussion of the Pile-Supported Dock Variant and Concentrate Pipeline Variant are integrated into the discussion where appropriate below.

4.25.2.3 Mitigation

Impacts to TES would be minimized or mitigated to the extent feasible through a variety of processes. Consultation with the USFWS and NMFS (collectively, the Services) and any resulting biological opinions would contain reasonable and prudent measures that would minimize impacts to TES. Measures that are included in the draft biological assessments to the Services (Appendix G and Appendix H) are included in Table 5-2; and Appendix M1.0, Mitigation Assessment. Furthermore, consultation under the MMPA may result in additional mitigation measures required by the Applicant. Implementation of these measures is designed to avoid and reduce potential impacts. Additional measures that may be incorporated are included in Appendix M1.0, Mitigation Assessment.

To summarize measures that would minimize potential impacts to TES, the project would use Best Management Practices (BMPs) for prevention, control, and management of invasive species, including implementation of an Invasive Species Management Plan (Owl Ridge 2019d) to avoid the importation of invasive species into the project area due to project activities during construction, operations, and closure. The invasive species management strategy would be developed at a later stage in the permitting process. Invasive species are discussed in greater detail in Section 4.26, Vegetation. In addition, tug and barge speeds in Kamishak and Iliamna Bay (defined as a longitudinal line west of 153°15′0″ west [a vertical line between Oil Bay and Cape Douglas]) would be controlled to minimize the potential impacts to the species (Figure 3.25-1). This would involve regulating vessel speeds to less than 10 knots (knot is a unit of measure for speed of aircraft or boats; 1 knot equals 1.15 miles per hour) in Kamishak Bay to reduce the potential for collision and disturbance for all TES. A lighting plan would be developed to reduce construction and operational lights around the port that might attract Steller's eiders, or lighting that might assist eiders in early detection of structures. Finally, a Wildlife Interaction Plan would be developed that deals primarily with terrestrial wildlife interactions. Guiding principles of wildlife reporting, adaptive management, and BMPs would be implemented for marine wildlife.

The following measures are detailed in the NMFS Biological Assessment (Appendix H) (which is specific to Alternative 3) and summarized in this section. Measures that are already listed elsewhere (such as spill response measures in Table 5-2) are not repeated below. These measures are preliminary, and not considered final until conclusion of the consultation process with the NMFS.

- The project would employ PSOs to monitor shutdown exclusion zones during project construction activities that produce underwater noise levels above harassment or injury take thresholds.
- To mitigate for construction noise impacts to cetaceans and pinnipeds during construction, the Applicant would develop and implement a 4MP. Details of the 4MP include the use of PSOs, ramp-up procedures, monitoring of zones, and others.
- Blasting in Iliamna Bay above the high tide line for construction of the Diamond Point port access road would be timed to coincide with times when tides are at or near minimum elevation to avoid in-water transfer of sound.

- Vessel speeds would be limited to 10 knots in lower Cook Inlet north of Augustine Island to mitigate potential vessel strike with marine mammals.
- The mooring systems and components of the anchor cable would be annually inspected each fall after the close of the Cook Inlet salmon setnet fishery to ensure they are in good working order. Any debris caught on the cables would be removed and properly disposed of at that time.
- Measures to reduce accidental spills would include the use of marine radar to assist in avoidance of other vessels and with accurate approach to the wharf.
- The concentrate conveyor would be fully enclosed to contain dust and shed snow.
- The barge loader would be fitted with a mechanical dust collection system; each barge would have a cover system to minimize fugitive dust and protect the concentrate from precipitation. During lightering operations, the barge's internal system would retrieve and convey concentrate to the bulk carrier via a self-discharging boom conveyor. The boom would be fully enclosed and equipped with a telescoping spout; it would also have mechanical dust collection to prevent spillage of fugitive dust.

The following measures are detailed in the USFWS Biological Assessment (Appendix G) (which is specific to Alternative 3) and summarized herein. For measures that are already listed elsewhere (such as spill response measures in Table 5-2), they are not repeated below. These measures are preliminary, and not considered final until conclusion of the consultation process with the USFWS.

- The project would employ PSOs to monitor shutdown exclusion zones during project construction activities that produce underwater noise levels above harassment or injury take thresholds for northern sea otter.
- To mitigate for construction noise impacts to sea otters, the Applicant would develop and implement a 4MP. Details of the plan include the use of PSOs, ramp-up procedures, monitoring of 984-foot exclusion zones around fill placement activities, and others.
- Vessel speeds would be limited to 10 knots for all project construction vessels operating inside the northern sea otter critical habitat.
- During operations, supply barges, fuel barges, and concentrate bulk vessels would travel at their normal cruising speeds when entering lower Cook Inlet, but would reduce speeds to less than 10 knots when entering sea otter foraging habitat (delimited by the 66-foot depth contour). All lightering barges would operate at speeds less than 10 knots.
- Guide cables would not be used to secure the communications tower to minimize avian collision risk.
- A lighting plan would be developed to reduce construction and operation lights that might attract eiders, or lighting would be implemented that might assist eiders in early detection of structures.
- Measures to reduce accidental spills would include the use of marine radar to avoid other vessels and accurately approach the wharf.
- The concentrate conveyor would be fully enclosed to contain dust and shed snow.
- The barge loader would be fitted with a mechanical dust collection system, and each barge would have a cover system to minimize fugitive dust and protect the concentrate from precipitation. During lightering operations, the barge's internal system would retrieve and convey concentrate to the bulk carrier via a self-discharging boom conveyor. The boom would be fully enclosed and equipped with a telescoping spout, and would have mechanical dust collection to prevent spillage of fugitive dust.

4.25.3 No Action Alternative

Under the No Action Alternative, federal agencies with decision-making authorities on the project would not issue permits under their respective authorities. The Applicant's Preferred Alternative would not be undertaken, and no construction, operations, or closure activities specific to the Applicant's Preferred Alternative would occur. Although no resource development would occur under the Applicant's Preferred Alternative, Pebble Limited Partnership (PLP) would retain the ability to apply for continued mineral exploration activities under the State's authorization process (ADNR 2018-RFI 073) or for any activity not requiring federal authorization. In addition, there are many valid mining claims in the area, and these lands would remain open to mineral entry and exploration by other individuals or companies.

It would be expected that current State-authorized activities associated with mineral exploration and reclamation, as well as scientific studies, would continue at levels similar to recent post-exploration activity. The State requires that sites be reclaimed at the conclusion of their State-authorized exploration program. If reclamation approval is not granted immediately after the cessation of activities, the State may require continued authorization for ongoing monitoring and reclamation work as it deems necessary.

4.25.4 Alternative 1a

Potential project sources of behavioural disturbance, injury and mortality, and habitat changes may occur to TES through construction, operations, and decommissioning of the marine portions of the Amakdedori port, natural gas pipeline in Cook Inlet, lightering locations, and lighted navigation buoys. This may occur through the presence of various project-specific vessels and aircraft in Kamishak Bay and lower Cook Inlet.

This section briefly highlights the project components that have a potential to impact TES and their critical habitat during construction. The in-water portion of the port at Amakdedori would be constructed during ice-free months between May and September in 1 year. The in-water portion of the Amakdedori Port would be constructed using a series of various-sized caissons placed in Cook Inlet that would support a concrete dock.

The caissons (pre-cast open-top concrete cubes with bottom measurements of 60 by 60 feet or 60 by 120 feet, depending on location) would be filled with water or fill material and allowed to settle on the sea floor. Minor seafloor excavation of 2 to 3 feet would be necessary to ensure the caissons are positioned correctly. A 30-foot temporary construction buffer is assumed to be necessary around each caisson during placement. Caissons would be floated into place using tugboats, and allowed to settle on the seafloor as the tide drops; or filled with material and sunk into place. Bridge beams would be placed on top of the caissons to support the main service deck of the dock. Two lighted navigation buoys (3 feet in diameter) would be placed on the subtidal reefs framing the entrance to Amakdedori port. The buoys would be placed on the reef using 3-foot-cubed concrete block anchors, with an anchoring design that prevents excessive anchor chain drag or swinging (PLP 2018-RFI 093). Permanent structures mounted on the causeway and or dock would include a fuel pipeline for unloading barges, a powerline for vessel shore power, a water supply line for firefighting, and illumination and navigation lights. No permanent cranes or fuel storage would be on the dock.

The construction and operations of the on-land portion of Amakdedori Port are not anticipated to impact marine mammal TES. Radio and/or cell service would be provided for communications at the port, with the required antennas being co-located with the port office facilities. A single communications tower may be required to support very high frequency (VHF) ship-to-shore communications, and for local area cellular telephone use by project staff. PLP would use a monopole tower arrangement that does not require support cables, to avoid potential impacts to

avian species from the use of supporting cables. The tower would be between 100 and 150 feet in height; and in accordance with FAA (FAA 2018b) and USFWS guidelines, would be marked with high-visibility paint bands, and may include flashing red lights at the top, if required. The communications tower at the port may pose a collision hazard to Steller's eiders, and are discussed below.

The two lightering locations would be constructed the same way and would have the same underwater footprint. The lightering locations would be constructed of a spread anchor mooring system approximately 2,300 feet by 1,700 feet, in approximately 80 feet of water. Each lightering location would consist of six mooring buoys held in place by 10 anchors total. Each mooring buoy would be attached via a 2-inch-diameter chain to gravity anchors (one station-keeping anchor [typically 3 feet by 3 feet by 3 feet] and one or two large mass rock/concrete anchors [typically 40 feet by 8 feet by 8 feet] connected by chain) placed on the bottom of Cook Inlet. The total footprint of both lightering locations for all anchors would be approximately 0.15 acre, and require a barge, support tugs, and supply vessels for installation.

The construction of the natural gas pipeline from Anchor Point to Amakdedori has the potential to impact TES. The construction of the Cook Inlet crossing of the pipeline would be expected to take 30 to 40 days, and may include up to 10 construction, support, and survey vessels. Pipeline construction is anticipated to occur between June through August in a single year. The 12-inch-diameter pipeline would be installed via horizontal directional drilling from the compressor station out into waters that are deep enough to avoid navigation hazards (PLP 2019-RFI 011a). From this point, the heavy-wall pipe would either be placed on the sea floor and anchored or supported as required, or trenched using a clam shell dredge, extended-reach backhoe, suction dredge, or jet sled working from barges. The temporary construction area corridor width would be 30 feet to include space for pipeline placement activities (PLP 2018-RFI 082). A fiber-optic cable would be co-located with the natural gas pipeline and may require additional vessels for installation depending on timing of installation.

During project construction, work crews would access sites by helicopter or boat until the port access road to the south ferry terminal is constructed. A permanent airstrip would be built at Amakdedori port to facilitate the construction phase of the port access road. Twin Otter or similar aircraft would make 20 to 40 flights per month (average of 5 to 10 flights per week) during the construction phase to Amakdedori port, before Kokhanok can be accessed by road. Once road access to Kokhanok is established, flights to and from Amakdedori port would occur infrequently for incidental/emergency access only.

Operations of the port and lightering locations would occur year-round. Each year, approximately 27 concentrate vessels and 33 supply barges (inclusive of 4 fuel barges) would be needed for transport (an average of one vessel per week). Each concentrate vessel would require 10 trips by a lightering barge between the port site and lightering location to fill the bulk carrier, which would be moored for 4 to 5 days. There would also be oceanic tugboats to pull the supply barges, and port-based tugboats would be used to assist the bulk carrier with mooring and to move the lightering barges. This would substantially increase vessel traffic in Kamishak Bay above current levels. As detailed in Section 3.12, Transportation and Navigation; and Section 4.12, Transportation and Navigation, there are currently low levels of vessel activity in Kamishak Bay. Areas crossed by marine transport include lower Cook Inlet, and extend to marine areas crossed by marine transport vessels, including concentrate bulk carriers from Cook Inlet through Shelikof Strait, and through the Aleutian Islands; and marine line haul barges from Cook Inlet to West Coast ports either through established marine routes across the Pacific Ocean or following near coast maritime routes along the Gulf of Alaska and Southeast Alaska. Based on the most recent vessel traffic studies, the increase in traffic during the operations phase would represent an approximately 12.5 percent vessel traffic increase in lower Cook Inlet

when compared to 2010 data (Eley 2012). Vessel traffic through the Aleutian Islands would increase by approximately 1 percent based on 2008-2009 traffic (ERM-West Inc. and Det Norske Veritas 2010). Vessel traffic studies specific to the Gulf of Alaska are not available, but traffic is expected to be similar to that of the North Pacific Great Circle route through the Aleutian Islands.

Reclamation of project infrastructure is detailed in Chapter 2, Alternatives. Some infrastructure would remain in place to support the long-term management of the water treatment facilities at the mine site. This may include the need for several barge trips annually to support post-closure and long-term maintenance activities. The Amakdedori port facilities would be removed, except for those required to support shallow draft tug and barge access to the dock for the transfer of bulk supplies. Limited barging activity would be necessary to supply fuel and water treatment consumables to support long-term water treatment and monitoring activities. The marine port facilities would eventually be removed and reclaimed after closure activities are completed (PLP 2018-RFI 024). The final details of physical reclamation and closure for the natural gas pipeline are currently undetermined, but it would be pigged and cleaned and either abandoned in place or removed, subject to state and federal regulatory review and approval at the decommissioning stage of the project. Impacts on TES from reclamation and closure activities are assumed to be similar to those for construction, but to a lesser extent. No impacts that are specific to reclamation and closure activities are anticipated for TES; therefore, reclamation is not discussed in detail in this section.

Table 4.25-3 summarizes the construction and operational impacts in the marine waters of Cook Inlet that may impact TES under Alternative 1a.

4.25.4.1 Cook Inlet Beluga Whale

Behavioral Disturbance

Underwater and Airborne Noise

As detailed in Section 3.25, Threatened and Endangered Species, Cook Inlet beluga whales have generally been observed north of the analysis area during summer months (primarily in upper Cook Inlet) and are less concentrated in the lower portions of Cook Inlet. Recently, there have been scattered reports of beluga whales in Kachemak Bay and outside Port Graham, which indicate that the species still occasionally uses lower Cook Inlet. Portions of Kamishak Bay were included in Critical Habitat Area 2 due to the potential to serve as fall and winter foraging and transit habitat for beluga whales, as well as spring and summer habitat for smaller concentrations of beluga whales (76 FR 20180). Project-specific surveys have not documented Cook Inlet Beluga whales around Amakdedori, but there are scattered records in Iliamna, Iniskin, and Chinitna bays. Cook Inlet beluga whales have a potential to be exposed to project-related airborne and underwater noise from a variety of sources during construction and operations. This may range from construction of the port, the natural gas pipeline, and fiber-optic cable, lightering locations, navigation buoys, and aircraft flights into and out of the airstrip at Amakdedori. Operations-related noise would be primarily from vessel activities at the port and lightering locations. An in-depth discussion on the hearing abilities of affected marine mammals and a general discussion on the effects of noise (primarily underwater) on marine mammals are presented in Appendix K 4.25, Threatened and Endangered Species.

Table 4.25-3: Summary of Construction and Operations Impacts for Alternative 1a

Project Component[1]	Impacts
Construction	
Caisson Dock	2.1 acres (permanent in-water footprint) plus 4.4 acres of temporary impacts from a 30-foot construction buffer around the permanent in-water footprint. 3.5 acres (permanent above-water footprint)
Lightering Locations[2]	The total spread of the anchors per lightering location is approximately 2,300 by 1,700 feet. The total substrate covered by the anchors is 0.15 acre from the combined footprints of all anchors necessary to hold the mooring buoys in place.
Lighted Navigation Buoys	3-foot cubes, one per buoy, two buoys total, placed on the surface of the subtidal reef at the entrance to Amakdedori port. Habitat impact would be 18 square feet of benthic marine habitat for both buoys.
Natural Gas Pipeline (and adjacent fiber-optic cable)	The maximum corridor width from anchors placed for the pipe-lay barge may extend out to 8,202 feet spanning the pipeline corridor (depending on the depth of Cook Inlet). On average, the pipeline corridor width would be about 1 mile wide and include both the physical trenching footprint and the station-holding anchors for the pipelay barge. The total pipeline length in Cook Inlet is approximately 104 miles. The pipeline would be trenched in or placed on top of the substrate, and result in approximately 626.6 acres of temporary disturbance to Cook Inlet. 33.8 acres (3.2 corridor miles) are in designated Cook Inlet beluga whale critical habitat, and 76.2 acres (10.7 corridor miles) are in designated northern sea otter critical habitat. 554 acres (95 corridor miles) of the pipeline traverse humpback whale critical habitat. The primary noise source during pipeline and fiber-optic cable placement emanates from tugboats during dynamic positioning. It was determined that a 1.7-mile radius was a conservative distance for the extent of underwater noise generated by the tugboats during anchor handling activities, which exceeds the 120-decibel harassment threshold for continuous noise sources. This 1.7-mile radius would encompass all potential noise sources, including those from various dredging technologies and from anchor handling. The average width of impacts (both physical and from underwater noise) would extend approximately 4.4 miles in width along the length of the pipeline though Cook Inlet.
Aircraft Activity	Approximately 20 to 40 flights per week for 1 year during construction of the port access road.
Operations	
Vessel Activity	27 concentrate vessel shipments would depart the lightering locations annually. Each concentrate vessel would be moored for 4 to 5 days and require 10 lightering trips to fill each concentrate vessel. An additional 33 supply barges (inclusive of 4 fuel barges) would be required annually to supply consumables, fuel, reagent, etc. This equates to 330 annual project-related vessel trips in the analysis area. This would result in an increase of vessel traffic in Cook Inlet by 12.5 percent and through the Aleutian Islands by 1 percent. There would also be oceanic tugboats to pull the supply barges and port-based ice-breaking tugboats to assist the bulk carrier with mooring, and to move the lightering barges. Vessel routes (shipping lanes) would extend north to Nikiski and south through the Gulf of Alaska to West Coast ports, and west along the southern side of the Aleutian Islands through Unimak Pass, into the Bering Sea, and out to the exclusive economic zone. The width of the vessel routes would be approximately 7.4 miles, and would encompass the zone of ensonification from project-related vessels.
Aircraft Activity	Infrequent and primarily for emergency use only.

Notes:
[1] Acreage calculations were determined based on the intersection of project components and geographic information system critical habitat layers from the US Fish and Wildlife Service and the National Marine Fisheries Service (depending on the species under their purview), along with the written description of the critical habitat primary constituent elements. The in-water portion of the port, the lightering locations, and lighted navigation buoys are considered permanent impacts. The 30-foot construction buffer and trenching for the natural gas pipeline are considered temporary impacts.
[2] The lightering locations are outside of designated critical habitat for Cook Inlet beluga whale and northern sea otter, but are in proposed critical habitat for the humpback whale.

Like most small- to medium-sized odontocetes (toothed whales), beluga whales have exceptionally good hearing at the high frequencies that are used for echo-location (Richardson et al. 1995a). Beluga whales are categorized as mid-frequency hearing cetaceans with functional hearing in the 50-Hertz (Hz) to 200-kilohertz (kHz) range (Ciminello et al. 2012). Although they are known to hear a wide range of frequencies, their greatest sensitivity is around 10 to 100 kHz (Richardson et al. 1995a), well above sounds produced by most industrial activities (<100 Hz or 0.1 kHz) recorded in Cook Inlet. Above 100 kHz, their sensitivity drops rapidly; however, the bandwidth of their hearing extends up to 150 kHz (Au 1993). Below 8 kHz, the decrease in sensitivity is more gradual (Awbrey et al. 1988), and beluga whales are able to hear frequencies as low as 40 Hz (Johnson et al. 1989); however, at these frequencies, their sensitivity is quite poor.

The frequencies of most industrial noises are below the peak sensitivities of beluga whale hearing (Blackwell and Greene 2003). It is important to note that audiograms presented in Blackwell and Greene (2003) represent the best hearing of beluga whales, measured in very quiet conditions. These quiet conditions are rarely present in the wild, where high levels of ambient sound may exist, especially in Cook Inlet, where strong tidal currents can produce sound levels well above 100 decibels (dB) (Lammers et al. 2013; Castellote et al. 2019).

Castellote et al. (2016b) attempted to document the natural ambient noise levels in Cook Inlet by using acoustic recordings collected by the Cook Inlet Beluga Acoustics (CIBA) research program from July 2008 to May 2013. One goal was to describe anthropogenic sources of underwater noise for acoustic impacts to Cook Inlet beluga whales. A second goal was to try to determine the natural background noise levels at different locations in Cook Inlet. Their findings indicated that natural background noise in the quietest days ranged from 95 to 99 dB re 1 µPa rms, which is much lower that previously reported (Castellote et al. 2016b). The acoustic mooring location closest to the analysis area was at Tuxedni Bay, which had relatively low anthropogenic noise compared to other locations with noise from commercial shipping traffic. The quietest 24-hour period at Tuxedni Bay was 96.03 dB re 1 µPa rms, and the quietest 30-second period within the same day that had minimal anthropogenic noise was 95.28 dB re 1 µPa rms (Castellote et al. 2016b). Therefore, these levels may be representative of the ambient noise levels in other locations in lower Cook Inlet that have lower levels of anthropogenic noise sources. The study found that noise from commercial ships was widespread, which may have a negative effect on beluga communication at elevated levels; there is a potential for acute masking of beluga communication across a wide temporal and spatial scale in their critical habitat (Castellote et al. 2016b). Data from Castellote et al. (2016b) indicate that natural masking might occur during high current velocities in certain areas of the upper inlet (only for the beluga whale lower hearing range), which is opposite to the common belief that the majority of Cook Inlet is naturally a noisy environment. In the analysis area, the increase in vessel noise from the project would be concentrated between the port and lightering locations for the life of the project, and add to the current noise levels in Kamishak Bay.

Potential impacts to beluga whales can include temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson et al. 1995a). Beluga whale responses to vessels noise varies greatly from tolerance to extreme sensitivity depending on the activity of the whale and previous experience with vessels (Richardson et al. 1995a). Beluga whale responses to vessel noise include changes in behavioral states (Richardson et al. 1995a), changes in vocalizations (Lesage et al. 1999; Scheifele et al. 2005; Gervaise et al. 2012) and avoidance (Blane and Jaakson 1994; Erbe and Farmer 2000). Lesage et al. (1999) observed changes in the vocal behavior of beluga whales in the presence of a 23-foot vessel powered by two 70-horsepower (HP) engines and a 2,173 gross-ton ferry, 260 feet long with two 2,000-HP engines, each fitted with a propeller 92.5 inches in diameter.

Vocal responses included a reduction in call rate, an increase in emissions of certain call types, repetition of specific calls, and a shift in frequency bands. Responses occurred more frequently when exposed to the ferry than the small vessel. Scheifele et al. (2005) documented the Lombard vocal response in beluga whales exposed to different vessel traffic in the St. Lawrence Estuary, Canada. The Lombard vocal response occurs when an animal increases the intensity of its vocalizations in response to a change in the environmental noise. Gervaise et al. (2012) suggest that the chronic anthropogenic noise associated with ship traffic in the mouth of the Saguenay River likely masks beluga whale communication and echolocation vocalizations. Ship traffic within a few miles can increase low-level frequencies of sound by 25 dB above background levels, which is sufficient to mask marine mammal communications (Holt et al. 2009; Bassett et al. 2012). Blane and Jaakson (1994) observed avoidance behavior by beluga whales in the presences of a 16-foot inflatable boat with an outboard motor. Avoidance behavior of the beluga whales included decreased surfacing, increased speed, and bunching into groups. Once the disturbance ceased, beluga whales resumed their previous behavior. In addition, Blackwell and Greene (2003) observed beluga whales in close proximity to the *Northern Lights* cargo-freight ship docked with motors running (126 dB re 1 µPa) at the Port of Alaska, indicating that the beluga whales were not particularly bothered by the ship.

Spatial displacements of beluga whales caused by loud sources of noise have been documented. Underwater noise from project-related activities during all phases of development could affect passage of Cook Inlet beluga whales in their critical habitat. Although the natural underwater soundscape of Cook Inlet is not considered a noisy environment for beluga whales, the Cook Inlet Beluga Whale Recovery Plan considers anthropogenic noise as a serious threat to the whale's recovery (Castellote et al. 2019). In addition, noise produced above water (e.g., from the increase in air transportation) may also impact beluga whales, who may alter behavior (e.g., by diving) to avoid noise from aircraft (Luksenburg et al. 2009).

The Alaska Fisheries Science Center deployed Ecological Acoustic Recorders (EARs) in Cook Inlet, year-round, as part of a CIBA research program between 2008 and 2013 (Castellote et al. 2019). Recorders that were deployed closest to the project were in Tuxedni Bay. The acoustic characteristics of most detected noise sources occurring across Cook Inlet beluga whale habitat have the potential to mask beluga hearing at certain frequencies, and also their communication (Castellote et al. 2019). Commercial shipping noise dominates the soundscapes, and events are longer in duration in lower Cook Inlet (Castellote et al. 2019). Shipping traffic in Cook Inlet is reduced in winter by 15 to 20 percent, and shipping speeds are lower when ice is present.

Construction of the port at Amakdedori, the lightering locations, and the natural gas pipeline and fiber-optic cable would be done during the ice-free summer months when Cook Inlet beluga whales are generally north of, and outside of the analysis area. However, the underwater noise generated during these construction activities may impact beluga whales if they are present. The main sources of noise impacts would be from excavation of the seafloor to seat the caissons at the port at Amakdedori in place and to fill them with material, and anchor-handling vessel activity, specifically the use of dynamic positioning on tugboats to set the pipelaying barge anchors in place during installation of the natural gas pipeline, as detailed in the following paragraphs.

Noise measurements specific to caisson filling and placement have not been recorded; therefore, a comparable surrogate noise-inducing activity was researched. In a recent programmatic consultation between the USACE and USFWS regarding effects to northern sea otters from activities permitted by the USACE, the USFWS found that all in-water use of heavy equipment for manipulating the substrate would result in a monitoring zone radius that could extend out to 984 feet from the sound source (USFWS 2015). The monitoring zone is a buffer that would require monitoring to avoid marine mammal Level A and minimize Level B harassment. The 984-foot monitoring zone radius is an appropriate monitoring buffer because a barge-mounted excavator

would be necessary to manipulate the seafloor (by excavation to create a level surface) for placement of the caissons. Although the consultation was related to northern sea otters, the same monitoring zone radius has been used in this analysis because it is applicable to Cook Inlet beluga whales based on potential sound production. A similarly sized monitoring zone would be monitored during placement of the anchors associated with the lighted navigation buoys.

During installation (trenching/dredging) of the natural gas pipeline, a variety of vessels and equipment would be operating and generating underwater noise levels with a potential to disturb Cook Inlet beluga whales and other marine mammals. The draft NMFS biological assessment (Appendix H) details the potential noise sources and types of equipment that may be used during installation of the natural gas pipeline and fiber-optic cable that is specific to Alternative 3, but similar methods would likely be used for the other alternatives and are briefly discussed here for Alternative 1a.

During the pipe-laying operation, a suite of equipment would be deployed that generates continuous underwater noise exceeding 120 dB threshold level for disturbance (Level B) of marine mammals. Because individual equipment operation varies in time and location, and occurs simultaneously with other equipment, the loudest noise source would generate the most conservative distance to the Level B threshold. This is the approach that was taken by NMFS (2018d) in their assessment of Harvest Alaska's 2018 Cook Inlet Pipeline Cross Inlet Extension Project (CIPL), an analogous pipeline project. The primary noise source during pipeline and fiber-optic cable placement emanates from tugboats during dynamic positioning (because position-keeping in Cook Inlet is a challenge due to the strong currents) thruster operation while maneuvering the pipe-lay barge, and drive propeller cavitation noise produced while handling anchors. During the CIPL project, it was determined that a 1.7-mile radius was a conservative distance for the extent of underwater noise generated by the tugboats during anchor handling activities, which exceeds the 120-dB harassment threshold for continuous noise sources. The specific details for how this was determined are provided in the NMFS draft biological assessment (Appendix H). In addition to the 1.7-mile-radius buffer around tugboats, the average width of the trenching corridor can range from a radius of 650 to 4,101 feet on either side of the pipe-lay barge due to the width of the station-holding anchors at various depths in Cook Inlet. The average width of the anchor spread supporting the pipe-lay barge was determined to be 1 mile. Therefore, when the 1.7-mile-radius buffer is placed around a 1-mile-wide corridor for the pipe-lay barge, the total impact area during installation of the natural gas pipeline and fiber-optic cable is approximately 4.4 miles wide.

To confirm that the greatest noise source during pipeline installation would come from the tugboats operating dynamic positioning, noise generated by anchor handling itself (without dynamic positioning with bow thrusters) was estimated by Illingworth and Rodkin (2007) as 178.9 dB re 1 µPa rms (micropascal root mean square) at 3.3 feet. The distance to Level B disturbance threshold was estimated at 1.3 miles (Illingworth and Rodkin 2007). Therefore, the underwater noise generated solely from anchor handling is less than tugboats operating dynamic positioning in Cook Inlet. The zone that would be monitored to reduce impacts from dynamic positioning noise would encompass the zone for anchor handling.

Finally, the underwater noise generated solely from various dredging technologies was assessed to determine potential impacts. Underwater noise levels from various dredge technologies are detailed in Table K4.25-3 and in Table 4 in the NMFS draft biological assessment (Appendix H). The various underwater noise levels from dredge technologies range from around 146 to 178 dB re 1 µPa rms at 3.3 feet, which result in disturbance distances to the Level B threshold ranging from approximately 66 feet to 2,605 feet. These distances are all less than the 1.7-mile-radius distance for tugboats operating dynamic positioning. Therefore, the greatest underwater noise source from construction of the natural gas pipeline and fiber-optic cable installation is from the

tugboats themselves (during anchor-handling operations), and not any specific dredging equipment. The EIS analysis area encompasses the entire 1.7-mile-radius buffer around the proposed natural gas pipeline and fiber-optic cable route.

Once construction is complete, the main underwater noise impact for Cook Inlet beluga whales would be from vessel operations at the port and lightering locations. Vessels are major contributors to the overall acoustic environment (Richardson et al. 1995a), particularly in the Alaska and the Arctic regions (Huntington et al. 2015). In a 2012 Cook Inlet Vessel Traffic Study Report (Eley 2012), patterns of activities were described for vessels over 300 gross tons operating during 2010. Results showed that there were 480 port calls or transits through Cook Inlet, with 80 percent of the transits made by 15 ships for the purpose of crude oil and product transport, packaged commodity shipments, and passenger/vehicle carriage. This class of vessel is characterized with source levels of 160 to 200 dB re 1 µPa rms at 3.28 feet within the 6- to 500-Hz range (Richardson et al. 1995a). Blackwell and Greene (2003) recorded underwater noise produced by both large and small vessels near the Port of Anchorage. The *Leo* tugboat produced the highest broadband levels of 149 dB re 1 µPa at a distance of approximately 328 feet, while the docked *Northern Lights* (cargo freight ship) produced the lowest broadband levels of 126 dB re 1 µPa at 328 to 1,312 feet. Ship noise was generally below 1 kHz.

Project-related vessel traffic would increase by 330 vessel trips in the analysis area, and specifically in Kamishak Bay, where there is currently relatively little vessel traffic. This would increase the ambient soundscape for whales transiting and feeding in the area from a variety of vessels including tugboats, lightering vessels, barges, and concentrate vessels. Potential noise impacts to beluga whales would be lower during the summer months, when beluga whales are generally in upper Cook Inlet. During the winter months, the ambient soundscape of lower Cook Inlet was much quieter than upper Cook Inlet (Castellote et al. 2019); therefore, the impact from project-related vessel traffic would be greater during winter, when Cook Inlet beluga whales are more likely to occur in the analysis area. Results from the CIBA research program indicate that the closest EARs buoy in Tuxedni Bay had low anthropogenic noise, because it is relatively isolated from anthropogenic activity compared to other EAR locations.

Part of the analysis area includes a vessel route that extends north to Nikiski and may include project-related barge traffic. During operations, the four annual fuel barges would most likely come from West Coast ports, although it is possible that some of the fuel could be sourced from the refinery in Nikiski. Based on current knowledge of beluga seasonal distribution, beluga whales could realistically be encountered during winter vessel activity to and from Nikiski, because vessels would pass near the mouth of the Kenai River where some portion of the beluga whale population still winter (Shelden et al. 2015). There is a potential for underwater noise from shipping traffic during operations to exceed the Level B disturbance threshold. To account for this potential noise from project vessels operating within the 4.6-mile-wide vessel route, a 1.4-mile buffer was placed on either side of the vessel route for a total 7.4-mile-wide vessel route. Therefore, any beluga whales within the 7.4-mile-wide vessel route may experience Level B disturbance if project-related vessels are transiting past at the same time beluga whales are present. However, this is unlikely, due to the use of the vessel route to Nikiski on an infrequent basis.

In summary, the duration that beluga whales may be exposed to underwater sound from construction-related vessels and aircraft would be short-term and temporary during pipeline installation and construction activities. The exposure would only be expected when seasonal distribution and habitat selection overlap in time and space with in-water project activities. Most Cook Inlet beluga whales spend the ice-free months in the upper portion of Cook Inlet (Goetz et al. 2012; Shelden et al. 2015), to the north of the analysis area. As Cook Inlet beluga whales shift south into the mid-inlet during fall and winter months (Hobbs et al. 2005), they have a higher potential to be affected by noise associated with the project as compared to the summer (when

they are generally outside of the analysis area). The extent of noise impacts from operations would be limited to the port and lightering locations, and the duration would last through the life of the project. Underwater noise from vessels and aircraft would exceed disturbance (Level B) acoustic harassment thresholds; underwater noise from pile-driving would exceed injury (Level A) and disturbance (Level B) harassment thresholds. Mitigation and monitoring would be implemented to avoid Level A and minimize Level B harassment. Although temporary construction-related noise levels would be monitored to reduce and minimize potential impacts to Cook Inlet beluga whales and prevent potential harassment, there would be a localized permanent increase in underwater noise due to year-round project-induced vessel traffic that would last for the life of the project.

Physical Presence (Vessel and Aircraft)

An increase in vessel traffic would occur from construction and operations of Amakdedori port, the lightering locations, lighted navigation buoys, and placement of the natural gas pipeline. Currently, there is no baseline estimate for the number of vessels using Kamishak Bay, and specifically the area around Amakdedori port, but the number is expected to be low because this area is outside of major shipping lanes; has no nearby port or community; there are no large commercial fisheries in the immediate vicinity. Castellote et al. (2019) found that the main shipping route used by commercial vessels may change based on dense ice aggregations, with a shift towards the eastern part of the mid-inlet. The estimated timeframe for construction of the port, lightering locations, and natural gas pipeline corridor was summarized previously, and full details are provided in Chapter 2, Alternatives. There would be an increase in vessel traffic during construction and operations, as detailed above in Table 4.25-3.

NFMS researchers have witnessed avoidance and overt behavioral reactions by Cook Inlet beluga whales when approached by small vessels (Lerczak et al. 2000). Blackwell and Greene (2003) observed tolerance of beluga whales to large cargo-freight ships at the Port of Anchorage. Beluga whales reacted to aircraft flying 500 to 700 feet away, by diving for longer periods, reducing surfacing time, and sometimes swimming away; however, they did not respond to aircraft flying 1,640 feet away (Richardson et al. 1995a). However, in Cook Inlet, beluga whales, including adults with calves, appear to exhibit site fidelity, returning to estuary areas even after a disturbance (Moore et al. 2000). Beluga whales continue to occupy middle and upper Cook Inlet despite continued industrial development, vessel and aircraft traffic, and dredging operations. Moore et al. (2000) concluded that beluga whales appear to have become habituated to offshore oil and gas activities in central Cook Inlet.

The analysis area does not appear to currently be a major use area for beluga whales at any time of the year. Based on data presented in Section 3.25, Threatened and Endangered Species, beluga whales have not been regularly detected around Amakdedori port. Although vessel traffic is common in certain areas of Cook Inlet from fishing and existing industry activity, especially during the summer and early autumn months, the project-related vessel traffic would increase by 330 vessel trips in the analysis area, where there is currently relatively little vessel traffic. This would not only increase the ambient soundscape for whales feeding and transiting the area, but would increase the potential for interactions with animals. Vessel presence impacts would be lowest during the summer months when beluga whales are generally in upper Cook Inlet, and more pronounced during the winter months. However, project-related vessels would be traveling slowly (less than 10 knots), so the potential for vessel disturbance would be limited. Furthermore, the extent of the physical presence of vessels is expected to be limited to the area around Amakdedori port. The duration of time that Cook Inlet beluga whales may be exposed to physical presence of vessels would be for the life of the project, but would vary annually. Vessels associated with project activities would have a transitory presence in any specific location. It is

expected that effects on Cook Inlet beluga whales may include behavioral changes such as in surfacing, breathing, and diving patterns, group composition, and vocalizations (Malcolm and Penner 2011). In Alaska, beluga whales were observed to stop feeding and move downstream in the presence of outboard motorboats. However, the same animals were less responsive to local fishing boats, to which they may have become habituated, suggesting that with time, beluga whales in the vicinity of the project have a potential to become more tolerant to vessel traffic (Malcolm and Penner 2011). Although vessels are transiting between Amakdedori port and the lightering locations, there is a period when vessel disturbance and presence of beluga whales may coincide. Because physical presence of vessels is expected to occur infrequently and concurrence with the presence of whales is likely to be short-lived, impacts of the physical presence of project vessels are not expected to cause more than a temporary effect on Cook Inlet beluga whales.

Cook Inlet beluga whales may be exposed to the physical presence of aircraft during construction of Amakdedori port. Aircraft traffic is projected to occur in the summer months; therefore, exposure to aircraft presence would occur primarily during the ice-free summer months when Cook Inlet beluga whales are primarily outside of the analysis area in upper Cook Inlet. The duration of time that Cook Inlet beluga whales may be exposed to physical presence of aircraft would be short-term and temporary, occurring only during the construction period of the port access road.

Impacts to Cook Inlet beluga whales that may occur as a result of disturbance from vessel and aircraft traffic associated with project activities would be changes in behavior, movement patterns, or habitat use. This may include brief behavioral responses such as reducing surface time and diving. Disturbance to Cook Inlet beluga whales from vessel presence is anticipated to be long-term and last for the life of the project. The extent would encompass the analysis area, primarily between Amakdedori Port and the lightering locations. The magnitude of impacts is anticipated to be low, because Cook Inlet beluga whales are not frequently observed in the analysis area, particularly in the area where vessels would be transiting. Aircraft traffic is anticipated to have minimal impact on Cook Inlet beluga whales for many of the same reasons; however, the duration would be much shorter, lasting only for construction of the port and port access road. Furthermore, aircraft overflight disturbance would be very brief, only occurring during take-off and landing near the port.

Injury and Mortality

Vessel Collision

Vessels in Cook Inlet generally transit year-round, primarily in established shipping routes (mainly on the eastern side of Cook Inlet) used by large vessels (Eley 2012). Eley (2012) details the main shipping lanes in Cook Inlet that occur east of Augustine Island in the middle of Cook Inlet and along the eastern edge. Based on a review of the Large Whale Ship Strike database, Jensen and Silber (2004) found that vessel speed was an important indicator of strike potential, with the mean speed that resulted in whale injury or mortality at over 18 knots. Data gathered by Jensen and Silber (2004) indicated that the number of vessel strikes by vessels traveling less than 10 knots was low. To reduce the potential for injury and mortality to North Atlantic right whales (*Eubalaena glacialis*), NMFS established a 10-knot speed limit for vessels over 65 feet in length during certain locations and times of the year (73 FR 60173). Following its implementation, this restriction was successful in reducing injury and mortality to the species. This is in line with the 10-knot speed limit for project-related vessels operating between the port and lightering locations.

Neilson et al. 2012 documented 108 ship strikes in Alaska from 1978 to 2011, and the data indicated that baleen whales are more susceptible to vessel strike than toothed whales. There

are no records of lethal vessel strikes involving Cook Inlet beluga whales. No publicly available reports have been published since Neilson et al. 2012 that disclose more recent ship strike information across Alaska. A 2017 report from the National Park Service regarding humpback whale monitoring in Glacier Bay and adjacent waters provides the most updated information regarding vessel collisions for southeast Alaska (Neilson et al. 2018). In the report, all documented whale-vessel collisions were with humpback whales.

Generally, beluga whales are most often observed within a few miles of shore, so the probability of vessel strikes is lower in the middle of Cook Inlet, but may increase as vessels approach Amakdedori port. When vessels are transiting nearshore areas, speeds would be decreased, and vessels would be restricted to traveling at 10 knots or less (Chapter 5, Mitigation, Table 5-2). Encounters between beluga whales and project vessels could occur, although the probability based on current whale survey data is low. An encounter would be defined as observing an animal from the vessel, but not making contact. Lethal vessel strikes are not expected because vessels would be transiting between the port and lightering locations at slow speeds (less than 10 knots) that improve ability to detected and avoid marine mammals. Generally, supply, lightering, and fuel barges already operate at speeds less than 10 knots and only concentrate bulk carriers with normal cruising speeds of 13 to 15 knots would need to reduce their speed to 10 knots or less. Although lethal vessel strikes involving Cook Inlet beluga whales have not been directly confirmed, two dead beluga whales with blunt trauma indicative of ship strike were documented (one in September 2007, and one in October 2012), and reports and photographs of beluga whales with scarring patterns consistent with propeller injuries have been documented (NMFS 2016b). Due to the slower speeds and general straight-line movements of large ships, strikes from large vessels are not anticipated to pose a significant threat to Cook Inlet beluga whales (NMFS 2008a). Furthermore, based on the Cook Inlet beluga whale recovery plan, NMFS has no data to support that commercial shipping vessels, commercial fishing vessels, or other large vessels are presenting significant concerns related to ship strikes (NMFS 2008a).

Therefore, the probability of vessel collision with Cook Inlet beluga whales is low, the duration would last for the life of the project, and extent would be focused on the lower portion of the analysis area, primarily between the port and lightering locations. The magnitude of impact should a beluga whale be struck and killed would be high because any mortality of a species with a small population size has a greater impact at the population level.

Entanglement

Project components such as the anchor chains for the six mooring buoys at each lightering location are not anticipated to pose an entanglement hazard to beluga whales. Entanglement in mooring and anchor chain has not been recognized as a threat to the species. The 2-inch diameter chain would remain relatively taut, preventing kinking, and would not be slack. The anchor chain is anticipated to pose no entanglement risk for Cook Inlet beluga whales.

Habitat Changes

Cook Inlet beluga whale habitat use in the analysis area is discussed in detail in Section 3.25, Threatened and Endangered Species. The Cook Inlet beluga whale's primary foraging locations include the Susitna River Delta (the Big and Little Susitna Rivers), Eagle Bay, Eklutna River, Ivan Slough, Theodore River, Lewis River, and Chickaloon Bay and River (NMFS 2008a; 2016b). All of these locations are considerably north of and outside the analysis area. Cook Inlet beluga whales are found farther south in Cook Inlet during the fall and winter months, resulting in a higher probability of overlap with project activities during that time. Physical disturbance to habitat would occur at the dock, lighted navigation buoys, lightering locations, and the pipeline corridor. These impacts are further discussed in the critical habitat section below.

Overall, potential impacts to habitat may include increased erosion/soil displacement and run-off/ pollution from the port access road and Amakdedori port. However, runoff, sedimentation, and potential discharges into the environment would be minimized per mitigation measures outlined in Chapter 5, Mitigation, Table 5-2.

Critical Habitat

Cook Inlet beluga whale critical habitat is discussed in detail in Section 3.25, Threatened and Endangered Species, and shown in Figure 3.25-1. In summary, Critical Habitat Area 2, the only designated critical habitat that exists in the analysis area, includes nearshore areas along western Cook Inlet and Kachemak Bay. Area 2 encompasses known fall and winter foraging and transit habitat for beluga whales, as well as spring and summer habitat for smaller concentrations of beluga whales.

Cook Inlet beluga whale critical habitat includes intertidal and subtidal waters of Cook Inlet with depths less than 30 feet mean lower low water, and within 5 miles of high- and medium-flow anadromous fish streams (50 Code of Federal Regulations [CFR] Part 226.220(c)(5)]). The potential project impacts on the physical or biological features of beluga whale critical habitat would include disturbance and resuspension of sediments in the water column, installation of structures, and discharges of fill into marine waters during construction. Additional critical habitat Primary Constituent Elements (defined in CFR as the principal biological or physical constituent elements for this species) that may be impacted include disturbance to primary prey species, and in-water noise levels resulting in abandonment of critical habitat areas. Because construction of the port would occur during summer months when beluga whales are generally absent, and mitigation measures would be implemented to prevent harassment of beluga whales, in-water noise levels during construction are not likely to cause abandonment of critical habitat areas.

The potential impacts to Cook Inlet beluga whale critical habitat from construction of project components would include seafloor disturbance and habitat alteration in the form of increased turbidity and habitat loss from project activities. Permanent direct impacts (detailed in Table 4.25-3) would be placement of fill in approximately 2.1 acres of designated Cook Inlet beluga whale critical habitat. Although the combined footprints of the caissons are 2.1 acres, the overhead dock footprint is 3.5 acres. There is a 30-foot temporary disturbance buffer around each caisson footprint to allow for maneuvering and settling the caisson in place, which equates to 4.4 acres of temporary seafloor disturbance. There would also be minor habitat loss from placement of the lighted navigation buoy anchors, and an additional 33.8 acres (3.2 miles in corridor length) of critical habitat would be temporarily disturbed during installation of the natural gas pipeline. These acreages were calculated based on the area of critical habitat (derived from NMFS geographic information system layers) that overlaps with project components. All impacts to beluga whale critical habitat represent a small fraction of the available habitat in Critical Habitat Area 2. The lightering locations are not in critical habitat for Cook Inlet beluga whales, so there would be no impact or loss of habitat from installation of the anchors for the mooring buoys at the lightering locations.

Overall, the magnitude of impacts to Cook Inlet beluga whale Critical Habitat Area 2 would be minor, given the large amount of available critical habitat (3,013 square miles) that would not be impacted. The extent of impacts would be localized, and limited to the dock, lighted navigation buoys, and natural gas pipeline corridor. The duration of impacts would be permanent, for the life of the project for the dock and lighted navigation buoys, and temporary for installation of the natural gas pipeline.

Food Sources

Beluga whales feed on a variety of fish, shrimp, squid, and octopus (Burns and Seaman 1986). Common prey species in the Susitna Delta and Knik Arm (where beluga whales concentrate during the summer to feed) include salmon, eulachon, and cod. The concentrated feeding areas for Cook Inlet beluga whales are in upper Cook Inlet, north of the analysis area. Prey species may be slightly impacted by vessel activities during construction due to increased water turbidity during installation of the natural gas pipeline. In addition to habitat disturbance, a discussion on the potential impacts from sound on food sources is provided in Appendix K4.25, Threatened and Endangered Species. Based on the noise analysis in Appendix K4.25, minor temporary disturbance to fish may occur during construction activities. Fish could avoid highly turbid areas during construction, and are not expected to suffer negative impacts. Based on the size of Cook Inlet, where beluga whale primarily occurs, versus the localized area where impacts may occur in the analysis areas, any missed feeding opportunities would be minor because other suitable feeding areas exist elsewhere.

In addition, beluga whale primary prey fish species could swim between the caissons, and their distribution and movement patterns in Kamishak Bay are not anticipated to be altered by the presence of the port.

Overall, the magnitude of impacts on food sources would be low. Cook Inlet beluga whales rarely feed on benthic fauna, and it is not expected that these animals would be impacted by disturbances to the benthic environment during installation of the natural gas pipeline or port (NMFS 2017c). Potential effects from seafloor disturbance on foraging quality would be temporary during construction and occur at a time when most beluga whales are north of the analysis area. Only the direct footprint of the port would remain permanently impacted.

4.25.4.2 Humpback Whale

Behavioral Disturbance

Underwater and Airborne Noise

Humpback whales have similar hearing thresholds in-air and underwater to other mysticetes. The underwater audiogram shows the typical mammalian U-shape with sensitivity to frequencies from 700 Hz to 1 kHz. Maximum relative sensitivity is between 2 to 6 kHz (Houser et al. 2001). NMFS has separated marine mammals into functional hearing groups with the generalized hearing range of low-frequency cetaceans, of which the humpback whale is categorized, between 7 Hz and 35 kHz. Humpback whale vocalizations generally range from 30 Hz to 8 kHz.

Humpback whales have shown a general avoidance reaction at distances from 1.2 to 2.5 miles from cruise ships and tankers (Baker et al. 1982, 1983), although they have displayed no reactions at distances of 0.5 mile when feeding (Watkins et al. 1981; Krieger and Wing 1986), and temporarily disturbed whales often remain in the area despite the presence of vessels (Baker et al. 1998, 1992). Dunlop (2016) considered the effect of vessel noise and natural sounds on migrating humpback whale communication behavior. Results showed that humpbacks did not change frequency or duration of common vocal sounds in response to increases in either wind or vessel noise. However, increases in vocal source levels and the use of non-vocal sounds (e.g., flipper and tail slaps on the water surface) were observed in response to wind noise, but not vessel noise. Dunlop suggested that humpbacks may be susceptible to masking from vessel sounds, but differences in the spectral overlap of wind and vessel sounds with humpback whale communication signals could also be contributing factors. Tsujii et al. (2018) determined that vessel noise caused humpback whales in Ogasawara, Japan waters to stop singing temporarily

rather than modifying the sound characteristics of their song through frequency shifting or source level elevation. Fournet et al. (2018) noted that humpback foraging calls in Southeast Alaska were approximately 25 to 65 dB lower than those reported by Thompson et al. (1986) in Hawaii, Mexico, Bermuda, and the West Indies, and that average source level estimates for humpback whale calls in the eastern Australian migratory corridor were 29 dB higher than those in Glacier Bay (Dunlop et al. 2013). This could be the result of overall lower ambient noise in Alaskan waters and shows that humpback whale calls on foraging grounds may be at risk for acoustic masking (Fournet et al. 2018; McKenna 2011).

Humpback whales have the potential to be impacted by vessel noise associated with the construction and operations of Amakdedori port, lightering locations, and construction of the natural gas pipeline corridor. Operations of the port and lightering locations would add 330 project-related vessel trips annually in the analysis area (including supply barges, concentrate barges, lightering vessels, and tugboats) for 20 years. This increase in vessel traffic, especially in areas around lightering locations in deeper water, would occur where humpback whales have been detected during the summer season. Potential noise impacts during operations would last for the life of the project, and may result in humpback avoidance of the area around the lightering locations.

This increase in the number of vessel trips in lower Cook Inlet could result in an interruption of normal behavior and result in humpback whales avoiding or leaving the area. After this response, surfacing, respiration, and diving cycles could be affected; although vessels moving slowly away from whales usually would not elicit such strong reactions (Richardson and Malme 1993). After single-disturbance incidents, at least some whales would be expected to return to their original locations, so the duration of impacts is anticipated to be short-term.

As detailed previously for Cook Inlet beluga whales, noise measurements specific to caisson filling and placement have not been recorded. Based on a recent programmatic consultation between the USFWS and USACE, in-water use of heavy equipment for manipulating the substrate would result in a monitoring zone radius that could extend out to 984 feet from the sound source (USFWS 2015). This is an appropriate monitoring zone radius, because a barge-mounted excavator would be necessary to manipulate the seafloor during placement of the caissons. Although the consultation was related to northern sea otters, the same noise monitoring radius is conservative, and applicable to humpback whales. A similarly sized monitoring area would be monitored during placement of the anchors associated with the lighted navigation buoys. The extent of potential noise impacts to humpback whales would be localized to the immediate vicinity of the caisson dock. Measures to avoid and minimize impacts from caisson placement to humpback whales would be determined through consultation with NMFS.

Noise would also be generated during trenching for natural gas pipeline installation, and humpback whales would likely have behavioral responses such as avoidance of the immediate area. The installation of the pipeline would span 104 miles across Cook Inlet, and coincide with summer months when humpback whales are present in Cook Inlet. Potential noise impacts would be similar to those for Cook Inlet beluga whales, and may extend out to 1.7 miles on either side of the tugboats operating dynamic positioning for the pipelaying barge. The general corridor width that would experience ensonification impacts and vessel activity would be 4.4 miles wide. This corridor width would extend along the entire length of the natural gas pipeline and fiber-optic cable route through Cook Inlet. Humpback whales may avoid the area during pipeline installation, and this could extend for the 30- to 40-day summer installation period.

During operations, there is a potential for noise impacts to humpback whales from vessels in the shipping lanes that would be used by the concentrate bulk carriers. Noise levels exceeding 120 dB from a concentrate bulk carrier vessel when traveling at cruise speed (13 to 15 knots)

would be contained within the 7.4-mile-wide travel corridor. Vessel traffic was evaluated in detail in the draft NMFS biological assessment (Appendix H) for Cook Inlet and the Gulf of Alaska, through Unimak Pass and into the Bering Sea. During operations, project-related vessel traffic would increase the estimated vessel traffic through the Aleutian Islands by approximately 1 percent (compared with 2008-2009 levels) (ERM-West Inc. and Det Norske Veritas 2010).

The extent and duration of effects on humpback whales due to noise from aircraft at Amakdedori port would be temporary disturbance and displacement during construction of the port access road. However, most humpback whales were not observed close to the Amakdedori port location, but were found closer to Augustine Island in deeper water. The airstrip would be used infrequently once the port access road from Amakdedori port to Kokhanok and the south ferry terminal are completed, because flights would land at Kokhanok instead of Amakdedori. Noise produced by aircraft above the water's surface does not pose a direct threat to the hearing of marine mammals in the water. However, short-term behavioral responses of cetaceans to helicopters have been documented in several locations, including Alaska (Patenaude et al. 2002).

Overall, impacts from construction noise would be short-term, and occur during summer months for up to 2 years during port construction. Underwater noise from vessels and aircraft would exceed disturbance (Level B) acoustic harassment thresholds. Mitigation and monitoring would be implemented to avoid Level A and minimize Level B harassment. Noise impacts would extent around the port and in the vicinity of the natural gas pipeline corridor during summer-time installation. Vessel noise would last for the life of the project during operations, especially when vessels transit to the secondary lightering location where humpback whales have been more frequently detected. Vessel noise would also extend throughout the shipping lanes. The magnitude of impacts would be evaluated through MMPA consultation. As part of the MMPA consultation process, a 4MP may be required in association with an Incidental Harassment Authorization to implement a robust monitoring strategy during construction activities to mitigate exposures and impacts from noise. This plan may be developed at a later stage in the permitting process, and is not included herein.

Physical Presence (Vessel and Aircraft)

Humpback whales' reactions to approaching boats are variable; ranging from approach to avoidance (Salden 1993). Humpback whales show general avoidance behavior to cruise ships and tankers at distances from 1.5 to 2.5 miles (Baker et al. 1983), but no reaction at distances beyond 0.5 mile when the whales were feeding (Krieger and Wing 1986). In addition, humpback whales are especially responsive to fast-moving vessels (Richardson et al. 1995a), exhibiting aerial behaviors such as breaching or tail/flipper slapping. However, temporarily disturbed whales often remain in the area despite the presence of vessels (Baker et al. 1992, 1998).

The magnitude of impacts to humpback whales from the physical presence of aircraft at Amakdedori port would be avoidance of the area or departure from the area. Only a few animals would likely be impacted because humpback whales are not expected near Amakdedori port; sightings of humpback whales in the vicinity of the port are limited (Shelden et al. 2013). The duration of exposure of humpback whales to the physical presence of aircraft would be temporary, during the 2 years of construction before flights are moved to Kokhanok.

The extent of impacts from the physical presence of vessels and aircraft would be the area near Amakdedori port, lightering locations (vessels only), and on the vessel routes. Data from ABR (2018c, 2018e) and from May 2018 northern sea otter surveys (Garlich-Miller et al. 2018) demonstrated the presence of humpback whales west and southwest of Augustine Island. The alternate lightering location for the project is in an area with a greater number of humpback whale sightings. Therefore, the magnitude of impacts from the physical presence of vessels would be

greater at the alternate lightering location compared to the primary lightering location. Humpback whales would experience impacts from the physical presence of vessels between the port and the lightering locations during the operations phase for the life of the project. Based on the short duration of potential exposure to the physical presence at any given location when vessels are present or aircraft pass over, the magnitude of effects on humpback whales would be limited to brief behavioral responses. Impacts from the presence of aircraft are unlikely during construction of the port due to the general lack of humpback whales around the port. However, impacts to humpback whales would be more likely because vessels travel between the port and lightering locations, particularly the alternate lightering location, where humpback whales are more regularly detected. In terms of likelihood, these impacts would be expected to occur if the project is permitted and constructed.

Injury and Mortality

Vessel Collision

There were 93 reports of humpback whale-vessel collisions in Alaska waters between 1978 and 2011, with only one confirmed record in upper Cook Inlet (Neilson et al. 2012). Between 2008 and 2012, the mean minimum annual human-caused mortality and serious injury rate for humpback whales, based on vessel collisions in Alaska, was 0.45 whale per year, as reported in the NMFS Alaska Regional Office stranding database (Allen and Angliss 2015). Based on Neilson et al. 2018, whale-vessel collisions involving humpback whales in 2017 in Southeast Alaska were comparable to previous years, with most incidents involving vessels traveling 20 knots or faster (for incidents where the boat speed was recorded).

Impacts to humpback whales as a result of injury or mortality from vessel collisions are not expected during construction of the port, because humpback whales are not usually found in the waters around the port, and vessels would be traveling slowly (less than 10 knots) enough to avoid encounters with whales.

The duration of impacts due to potential vessel collisions would be for the life of the project, and these impacts are more likely to occur during summer (as opposed to winter), when humpback whales are present in Cook Inlet. The likelihood for encounters between humpback whales and project vessels would be higher during operation of the mine, because vessels would be regularly transiting between the port and lightering locations. Currently, Kamishak Bay has a low number of vessels, and the project would add at least 330 vessel trips annually in the analysis area. Coupled with known humpback whale locations south and west of Augustine Island, this increases the potential for strike. However, slow vessel speeds (less than 10 knots) have been shown to have a reduced potential for vessel strike (Jensen and Silber 2004).

Because humpback whales are more common in the shelf and shelf edge waters of the Gulf of Alaska and Bering Sea, they are expected to occur in the vicinity of the vessel routes outside of Cook Inlet. The majority are expected to be members of the non-listed Hawaii DPS (Wade et al. 2016). They have a potential for increased risk to injury and mortality from additional project-related vessel traffic. The project would increase vessel traffic (from concentrate bulk carriers) by approximately 1 percent compared with 2008-2009 levels through the Aleutian Islands. Because there is no speed restriction imposed on project-related vessel traffic outside of Kamishak Bay, the concentrate bulk carriers would be traveling at their normal operating speeds between 13 and 15 knots. All concentrate ships would follow the shipping route through Shelikof Strait to Unimak Pass, where they would link with the Great Circle Route travel lane to Asia. The ships would remain over continental shelf waters for several hundred miles between Cook Inlet and Unimak Pass. Ships would traverse through areas known to be used by summering populations of humpback whales (Zerbini et al. 2006), especially Shelikof Strait and along ocean banks near the Semidi and Sanak Islands. Neilson et al. (2012) noted that vessel strikes of humpback whales

occurred most often where whale concentrations overlapped with shipping lanes, especially in narrow choke areas. Shelikof Strait may qualify as an area of higher vessel strike risk; because vessels would be operating at faster speeds, there would be a greater risk of lethal strike. Neilson et al. (2012) evaluated whale-ship strike data from 1978 to 2011, and found the majority (93 of 108 definite or possible whale collisions) to be from humpback whales. There was one instance of a humpback whale collision between Cook Inlet and Unimak Pass, but in shallow waters outside of the shipping routes. Based on the data from the 34-year study, there were approximately three whales stuck annually, with less than one per year as a definite mortality. Because project-related vessel traffic would increase overall vessel traffic slightly, the potential for a project-related vessel to cause a humpback whale mortality is low. The potential for a whale strike would last for the life of the project, until concentrate bulk carriers are no longer needed after operations cease.

Entanglement

Humpback whales have been documented becoming tangled in heavy-gauge cables/anchor lines (Neilson et al. 2018). Entanglement in anchor lines is uncommon, but in one instance near Craig, Alaska, a whale became tangled in a 1-inch cable line that get caught in its mouth and wrapped around its body. The cable connected a log barge to an anchor. A second instance, in Holkham Bay, a humpback whale became entangled in a 7/8-inch anchor chain from a commercial tour vessel that got caught in the whale's mouth and wrapped around its body. In both cases the chain was cut, and whales freed, but only after sustaining significant soft tissue injuries (Neilson et al. 2018). The anchor chains for the mooring buoys at the lightering locations would be in deep water where humpback whales have been documented. In particular, the alternate lightering location had multiple humpback whales sighted during the summer of 2018. The 2-inch anchor-chain size would keep the chain relatively taut and reduce the potential for kinking. The anchor chain in both cases was significantly smaller in diameter than the chain proposed at the lightering locations. Although entanglement in anchor lines is considered uncommon, there is a low potential for humpback whales to become entangled in the mooring chain.

Habitat Changes

The magnitude and duration of impacts from construction of the Amakdedori port and installation of the natural gas pipeline would be a temporary increase in sound levels from construction activities during summer months, when humpback whales are present in Cook Inlet. Vessel noise and physical presence would have a low impact on humpback whale habitat because the area potentially impacted covers a small percentage of the total habitat available to humpback whales in Cook Inlet. Humpback whales would be able to move away from project activities to feed, rest, or migrate in other nearby areas should they occur at the time of construction. The construction of the port is not likely to impact feeding areas for humpback whales because they rarely feed on benthic fauna. There would be a permanent loss of 0.15 acre of benthic marine habitat from placement of the mooring buoy anchors and temporary disturbance to the seafloor during natural gas pipeline installation. However, humpback whales rarely feed on benthic fauna, and they are not expected to be impacted by temporary disturbance in the benthic environment (NMFS 2017c). Because humpback whales do not feed in the benthos, the extent and duration of impacts from habitat alteration is considered minimal. Impacts from the loss of foraging opportunity and potential impacts on food sources are discussed in the next section.

Food Sources

A general discussion on the potential impacts from sound on food sources is provided in Appendix K4.25, Threatened and Endangered Species. Specific information on the humpback whale follows. The magnitude and duration of impacts from construction of Amakdedori port and

installation of the natural gas pipeline would be a temporary alteration of humpback whale foraging habitat in the form of increased turbidity. Humpback whales feed on small schooling fishes, euphausiids, and other large zooplankton. Humpback also feed on eulachon, Atka mackerel, Pacific cod, saffron cod, Arctic cod, juvenile salmon, and rockfish (Hain et al. 1982). Increased turbidity may have temporary impacts on small schooling fish and krill, which are important prey species for humpback whales. Any impacts around Amakdedori port would be minimal because humpback whales are not common in the vicinity of the port. Any feeding areas potentially avoided during construction of the natural gas pipeline or during installation of the mooring anchors would be minimal, because other feeding areas exist elsewhere. Therefore, the activities included in the analysis area are not expected to have any permanent habitat-related effects that could cause significant or long-term consequences for humpback whales. The extent of humpback whale prey habitat alteration is expected to be limited to the vicinity of the Amakdedori port site and the natural gas pipeline alignment. The duration of impacts from increased turbidity on humpback whale prey would be short-term, occurring only during construction. Increased turbidity from in-water work is expected to last a short time, as the tides and wave action in the marine environment flush the system.

Critical Habitat

On October 9, 2019, NMFS proposed designated critical habitat for the endangered humpback whale management stocks (84 FR 54354). NMFS proposed critical habitat for the Mexico DPS and Western North Pacific DPS, which overlap with the analysis area. The main consideration in developing this critical habitat is the presence of prey species. This project would not permanently affect prey species, as discussed above. There would be no impact to humpback whale critical habitat from construction of the port because proposed critical habitat is farther offshore. Construction of the natural gas pipeline may temporarily disturb 554 acres (95 miles) of humpback whale feeding areas due to the presence of vessels, pipelaying, trenching, and other activities while the natural gas pipeline is installed. Because Cook Inlet is highly turbid, increased turbidity on the seafloor from trenching activities is unlikely to affect feeding opportunities. In addition, the increased turbidity would occur in the benthic environment, and not in the upper water column where humpbacks typically feed.

The vessel routes through the Gulf of Alaska and along the Aleutian Islands to the Bering Sea traverse several critical habitat units for both the Mexico and Western North Pacific DPSs. Vessel traffic is not expected to impact the presence of prey species, but would temporarily increase the sound scape while project vessels transit through summer feeding areas. The vessel routes through proposed critical habitat are approximately 7.4 miles wide to account for a shipping lane, plus an area of ensonification from project vessels. The area that would temporarily be affected by noise while ships are passing through is small, compared to the overall size of the area proposed for critical habitat.

4.25.4.3 Fin Whale

Behavioral Disturbance

Underwater and Airborne Noise

Fin whales generally prefer deep marine waters in offshore areas, and their occurrence in lower Cook Inlet is infrequent and limited to the eastern side closer to the mouth of Cook Inlet. No fin whales have been detected around Amakdedori Port or around the lightering locations. The potential that fin whales may be impacted by project-related construction and operational noise at the port and lightering locations is low due to their lack of occurrence in Kamishak Bay. No

studies have directly measured the sound sensitivity of fin whales. Summaries of the best available information on marine mammal hearing are provided in Richardson et al. (1995a), Erbe (2002), Southall et al. (2007), and NMFS (2016b). The NMFS has separated marine mammals into functional hearing groups with the generalized hearing range of low frequency cetaceans; the fin whale is classified between 7 Hz and 35 kHz. However, fin whale vocalizations have been studied extensively. Fin whales produce a variety of low-frequency sounds in the 10- to 200-Hz band, with the most typical signals occurring in the 18- to 35-Hz range (USDOI 2015).

Vessels in transit to the analysis area during construction and operations of Amakdedori port and lightering locations have the potential to overlap with the fin whales' range. Sound masking is of concern for baleen whales that vocalize at low frequencies over long distances because their communication frequencies may overlap with anthropogenic sounds, such as shipping traffic. Fin whales have been shown to reduce their calling rate in response to boat noise (Watkins 1986). The effects of sounds from shipping vessels on fin whale calls were investigated by Castellote et al. (2012). They found that in locations with heavy shipping traffic, fin whale 20-Hz notes had a shortened duration, narrower bandwidth, decreased center frequency, and decreased peak frequency. These results indicate that fin whales likely modify their call characteristics to compensate for increased background noise conditions, which may help reduce potential impacts from anthropogenic sounds.

Impacts to fin whales from underwater and airborne noise around the port and lightering locations are not expected due to the species rarity in Cook Inlet. However, if the species is present in the analysis area during construction activities, based on details provided for the previous whale species, underwater noise associated with excavation for caisson placement could extend out to 984 feet from the sound source (USFWS 2015).

Noise would also be generated during trenching for the natural gas pipeline installation, and fin whales, if present, would likely have behavioral responses such as avoidance of the immediate area. Potential noise impacts would be similar to those for the previous whale species, and may extend out to 1.7 miles on either side of the tugboats operating dynamic positioning for the pipelaying barge. A similarly sized monitoring zone would be monitored during placement of the anchors associated with the lighted navigation buoys.

Operations of the port and lightering locations would add 330 project-related vessel trips annually in the analysis area. This would increase the vessel traffic, especially in areas around the lightering locations in deeper water where fin whales have a greater potential to occur. Potential noise impacts during operations would last for the life of the project, and may result in fin whale avoidance of the area around the lightering locations.

During operations, there is a potential for noise impacts to fin whales from vessels in the shipping lanes that would be used by the concentrate bulk carriers. Noise levels exceeding 120 dB from a concentrate bulk carrier vessel when traveling at cruise speed (13 to 15 knots) would be contained within the 7.4-mile-wide travel corridor. Vessel traffic was evaluated in detail in the draft NMFS biological assessment (Appendix H) for Cook Inlet and the Gulf of Alaska, through Unimak Pass and into the Bering Sea. During operations, project-related vessel traffic would increase the estimate vessel traffic through the Aleutian Islands by approximately 1 percent (compared with 2008-2009 levels) (ERM-West Inc. and Det Norske Veritas 2010).

Overall, impacts from construction noise would be short-term, and occur during summer months for up to 2 years during port construction. Underwater noise from vessels and aircraft would exceed disturbance (Level B) acoustic harassment thresholds. Mitigation and monitoring would be implemented to avoid Level A and minimize Level B harassment. Noise impacts would extent around the port and in the vicinity of the natural gas pipeline corridor during summer-time installation. Vessel noise would last for the life of the project during operations, especially when

vessels transit to the lightering locations. The magnitude of impacts would be reduced through implementation of mitigation measures (such as marine mammal monitoring) that would be further defined through MMPA consultation. As part of the MMPA consultation process, a 4MP may be required in association with an Incidental Harassment Authorization to implement a robust monitoring strategy during construction activities to mitigate exposures to noise and impacts to fin whales from noise exposure.

Physical Presence (Vessel and Aircraft)

Fin whales are rarely observed in Cook Inlet, with most sightings occurring near the entrance of the inlet (Shelden et al. 2013, 2015, 2016). Fin whales are more common in deeper waters of Shelikof Straight, and in the Gulf of Alaska on proposed vessel routes. Fin whales may exhibit varying reactions to the presence of vessels, ranging from attraction to avoidance (NMFS 2017b). Jahoda et al. (2003) studied the responses of fin whales in feeding areas when they were closely approached by inflatable vessels. The study concluded that close vessel approaches caused the fin whales to swim away from the vessel and to stop feeding. These animals also had increases in blow rates and spent less time at the surface (Jahoda et al. 2003). This indicates that the species would likely avoid project-related vessel traffic. However, due to fin whale's rarity in Cook Inlet, impacts to fin whale behavior as a result of the physical presence of vessels and aircraft from project construction and operations of the port and lightering locations would be low. There would be increased disturbance to fin whales in proposed vessel routes in the Gulf of Alaska, Shelikof Strait, and along the Aleutian Islands.

Injury and Mortality

Vessel Collision

Globally, fin whales are injured in collisions with vessels more frequently than any other whale species (Neilson et al. 2012). Three of the 108 reported whale-vessel collisions in Alaska between 1978 and 2011 were fin whales, none of which occurred in Cook Inlet (NMFS 2015). In 2015, one dead fin whale came into the Port of Anchorage on the bulbous bow of a ship traveling from Seattle with unknown initial strike occurrence (NMFS 2017c). Fin whales have a unique feeding habit of lunge feeding instead of skim feeding. These quick lunge movements put them at higher risk of collisions, especially with vessels, because their quick movements make it harder for vessel captains to avoid them (NMFS 2017c). Vessels would be traveling slowly (less than 10 knots) while transiting between the port and lightering locations. Vessel speeds of less than 10 knots have been shown to have reduced potential for whale collisions (Jensen and Silber 2004; 73 FR 60173). Because fin whales are uncommon in Cook Inlet, have not been detected around either the port or lightering locations, and vessels would be traveling slowly, impacts from injury or mortality from vessel collision in Cook Inlet not expected to occur.

Outside Cook Inlet, in the Gulf of Alaska, fin whales are much more common, especially in Shelikof Strait and along the shelf edge (Zerbini et al. 2006). Fin whales are also common along the Bering Sea shelf. During the summer months, they are likely to be found in the vicinity of shipping lanes traversing these areas. The project would increase vessel traffic (from concentrate bulk carriers) by approximately 1 percent compared with 2008-2009 levels through the Aleutian Islands. Because there is no speed restriction imposed on project-related vessel traffic outside of Kamishak Bay, the concentrate bulk carriers would be traveling at their normal operating speeds, between 13 and 15 knots, which results in an increased potential for whale-vessel collisions. Neilson et al. (2012) evaluated whale-ship strike data from 1978 to 2011, and three collisions (out of 108) were from fin whales. There was one instance of a fin whale collision between Cook Inlet and Unimak Pass, but in shallow waters outside of the shipping routes. Because project-related

vessel traffic would increase overall vessel traffic slightly, but an analysis of 34 years of whale-strike data show few instances of fin whale strikes, the potential for a project-related vessel to strike a fin whale is low. The potential for a whale strike would last for the life of the project, until concentrate bulk carriers are no longer needed after operations cease.

Entanglement

Similar to humpback whales, fin whales are potentially at risk of entanglement, with one documented fin whale mortality due to entanglement with an anchor line. In mid-April 2011, a fishing vessel was anchored via anchor line (consisting of a solid anchor, anchor chain, and anchor cable) in 210 feet of water in central Uyak Bay, Kodiak Island, where many fin whales had been sighted feeding on dense aggregations of larval fish (Benjamins et al. 2014). A mature fin whale became entangled in a fishing vessel anchor line after the chain was lodged in its mouth while feeding at depth. Once the chain (and possibly the anchor) became wedged in its mouth, the whale twisted, knotting the cable in several locations around its body. Ten days later, the carcass of the whale was found in Uyak Bay with the anchor chain and cable wrapped around it. This is unusual because it involved a fatality for a large whale with a relatively thick anchor line. Similar anchor lines are used widely around the world and are not considered to pose a risk to marine mammals (Benjamins et al. 2014). However, under circumstances with high concentrations of prey in low-light conditions, foraging baleen whales may have difficulty detecting or avoiding large cables and chains that are vertically suspended in open waters (Benjamins et al. 2014).

The lightering location mooring buoy anchor cables would be composed of a thick 2-inch diameter chain vertically suspended in water that is taut and relatively non-kinking. Fin whales have not been documented in the waters around the lightering locations and are rare in Cook Inlet. The potential risk of entanglement is considered low, especially because the case in Kodiak Island is considered a rare and unusual event.

Habitat Changes

The magnitude of impacts to fin whales from construction of Amakdedori port and installation of the natural gas pipeline would be a temporary disturbance of habitat in the form of increased turbidity. There would be a permanent loss of 0.15 acre from placement of the mooring buoy anchors in deeper waters at the lightering locations and 626.6 acres of temporary disturbance during natural gas pipeline installation. The habitat around the port is not likely used by fin whales due to the shallow depths where the port would be located. In addition, no fin whales have been documented around the port or lightering locations; therefore, minor loss of benthic habitat is unlikely to impact the species.

The magnitude and duration of potential habitat effects from seafloor disturbance such as changes to water quality and increased turbidity would be a temporary reduction in the foraging quality of the disturbed area for a short time during construction of the port and natural gas pipeline. Cook Inlet has ample foraging habitat in undisturbed areas around the natural gas pipeline where fin whales could feed during construction. Impacts from construction of the natural gas pipeline corridor would occur over one summer; afterwards, conditions are anticipated to return to pre-disturbance levels.

Food Sources

Fin whales in the North Pacific prefer euphausiids and large copepods, followed by schooling fish such as herring, walleye pollock, and capelin as prey. Because fin whales are not benthic feeders, or feed on benthic fauna only rarely (NMFS 2017c), it is not anticipated that these animals would be impacted by disturbances to the benthic environment from construction of the port or natural

gas pipeline. They feed by lunging into schools of prey with their mouth open, using throat pleats to gulp large amounts of food and water. A discussion on the potential impacts from sound on food sources is provided in Appendix K4.25, Threatened and Endangered Species; they are not anticipated to affect fin whale prey.

Critical Habitat

No critical habitat has been designated for the fin whale; therefore, none occurs in the analysis area and no impacts to fin whale habitat are anticipated.

4.25.4.4 Blue, Sperm, Sei, Gray, and North Pacific Right Whales

Five endangered whale species have a potential to occur in the project shipping routes in the Pacific Ocean, including the Gulf of Alaska, along the Aleutian Islands, and the Bering Sea. The North Pacific stocks of blue, sperm, and sei whales occur in the EIS analysis area along with the Western North Pacific DPS of the gray whale, and the Eastern North Pacific stock of North Pacific right whale. Because these species do not normally occur in Cook Inlet, where the majority of project-related impacts are anticipated to occur, but their ranges overlap with proposed vessel routes in the Gulf of Alaska, along the Aleutian Islands, through Unimak Pass, into the Bering Sea and out the exclusive economic zone, these species are discussed collectively herein. The same impacts from vessels (noise, physical disturbance, and potential for injury and mortality) previously detailed above for humpback and fin whales have a potential to occur for blue, sperm, sei, gray, and North Pacific right whales. The main potential impacts to listed populations of these whale species is a potential for behavioral disturbance, including disturbance from underwater noise from project vessels, and a potential for injury and mortality from vessel strikes.

Behavioral Disturbance

Underwater Noise

Noise from passing vessels could briefly disturb individual whales that are migrating or feeding in the area. Most whale species are more likely to be present during summer months, when many whales migrate north to feed. Some whale species (such as humpbacks and North Pacific right whales) may be found year-round in Alaska. Vessel routes are 7.4 miles wide and include a buffer around vessels from underwater noise that encompasses the Level B disturbance threshold. Vessel traffic would be greatest during operations when concentrate bulk carriers are transiting the area, but project vessels are only anticipated to increase vessel traffic by 1 percent. The magnitude of impacts would be that individual whales may be exposed to underwater noise from passing vessels, with impacts highest during summer months, when more whales are present. The duration would last for the life of the project, and be greatest during operations, when bulk carriers are transiting the vessel routes. The extent would encompass the various shipping routes. Overall, the impact of underwater noise on these five whale species is anticipated to be low.

Injury and Mortality

Vessel Collision

The vessel strike risk to whales is low from supply and fuel barges traveling along the proposed southern coastal and offshore travel corridors because these vessels typically travel at speeds of less than 10 knots. The vessel strike risk increases along the proposed western travel corridor, where the concentrate bulk carrier vessel would travel at speeds between 13 and 15 knots through areas (such as Shelikof Strait) where these species feed and migrate. Neilson et al. 2012 reviewed 108 instances of whale strikes between 1978 and 2011 in Alaskan waters, and found

one definite strike of a sperm whale (from the Gulf of Alaska), one of a gray whale (from unknown DPS in southeast Alaska), and no recorded strikes for blue, sei, and North Pacific right whale. However, based on the very low rate of recorded vessel strikes per year (approximately three) in Alaskan waters, and the low number of concentrate bulk carriers that would transit Alaskan waters for the project (approximately 27 per year), the risk of a project-related concentrate bulk carrier vessel strike is low.

Although the risk of ship strikes to these five primarily pelagic whale species is low, there have been additional instances where whales have died from vessel strikes. In a recent case in Southeast Alaska, a dead male sperm whale was found washed up on a beach in the Inside Passage (NOAA 2019e). The whale had three deep propeller slices to its side, plus fractured vertebrae consistent with a ship strike.

Habitat Changes

There are no habitat changes anticipated to any of these five whale species from use of the vessel routes. The analysis area does not overlap with the critical habitat for North Pacific right whale.

4.25.4.5 Steller Sea Lion

Behavioral Disturbance

Underwater and Airborne Noise

Steller sea lions have the potential to be seasonally affected by vessel noise associated with the project components during both the construction and operation phases. As detailed in Section 3.25, Threatened and Endangered Species, Steller sea lions have been detected as individuals and in low numbers around Amakdedori, along the coastline, and around the lightering locations. Shaw Island, a recognized haulout location, would experience increased vessel noise as vessels transit between Amakdedori Port and established shipping lanes in Cook Inlet. Shaw Island is approximately 32 miles southeast of Amakdedori port and 13.5 miles south of where the natural gas pipeline would be located in Cook Inlet. In addition, there are several haulouts and rookeries outside of Cook Inlet that would be transited past (but vessels would not come within 5 nautical miles) by the vessel routes on the southern side of the Alaska Peninsula and along the Aleutian Islands.

Steller sea lions have hearing thresholds in-air and underwater that are similar to other otariids. In-air hearing range is 0.250 to 30 kHz, with a region of best hearing sensitivity from 5 to 14.1 kHz (Muslow and Reichmuth 2010). The underwater audiogram shows the typical mammalian U-shape, with the range of best hearing 1 to 16 kHz. Higher hearing thresholds indicating poorer sensitivity were observed for signals below 16 kHz and above 25 kHz (Kastelein et al. 2005). One study of sea lion hearing found that California sea lions can detect realistic, complex acoustic signals in the presence of masking vessel noise better than predicted by a basic hearing model (Cunningham et al. 2014).

Noise that exceeds Level B harassment levels associated with caisson placement, previously detailed above, can extend out to 984 feet (USFWS 2015). A similarly sized area would be monitored during placement of the anchors associated with the lighted navigation buoys. Noise from construction of the natural gas pipeline and fiber-optic cable installation can result in noise levels that would require monitoring out to 1.7 miles on either side of the tugboats operating dynamic positioning for the pipelaying barge.

Mitigation and monitoring would be implemented to minimize Level B harassment. The duration that Steller sea lions may be exposed to sounds from vessels and aircraft would be temporary

during port construction and pipeline installation. Once port construction is complete, primary noise impacts would come from operations of vessels transiting the port, lightering locations, and in the vessel routes outside of Cook Inlet. Impacts from vessel noise would last for the life of the project, because at least 330 annual project-related vessel trips would be added in Kamishak Bay.

Physical Presence (Vessel and Aircraft)

Generally, sea lions in water show tolerance to close and frequently approaching vessels, and sometimes show interest in fishing vessels. Sea lions may become accustomed to repeated slow vessel approaches, resulting in minimal response (NMFS 2008c). Although low levels of occasional disturbance may have little long-term effect, areas subjected to repeated disturbance may be permanently abandoned. Regulations are in place to minimize disturbance of animals by humans, especially on rookeries (NMFS 2008c). Steller sea lions are less tolerant when hauled out on land; however, they rarely react unless the vessel approaches within 330 to 660 feet (Richardson et al. 1995a). Sea lion pups on land are vulnerable to trampling if adults are panicked by low-flying aircraft. Small numbers of Steller sea lions use areas around the port and lightering locations; those individuals or groups could be disturbed by project activities. Shaw Island, a recognized haulout location, is approximately 32 miles southeast of Amakdedori port and 13.5 miles south of where the natural gas pipeline would be in Cook Inlet. Ships that are transiting to the port would likely pass several miles north of Shaw Island, and are not likely to impact the haulout location by their physical presence.

Overall, Steller sea lions are more abundant near the mouth of Cook Inlet, which has a high level of vessel activity during summer from recreation, commercial fisheries, barging, and other vessel traffic. Steller sea lions inhabit waters of Alaska year-round; however, large numbers of individuals may widely disperse from concentrated breeding areas and rookeries after the breeding season (late May through early July), likely to access seasonally important prey resources (Muto et al. 2018).

Calkins (1979) reported that the reaction of Steller sea lions to aircraft is variable. Aircraft associated with the project would not be expected to operate in the vicinity of Steller sea lion haulouts or rookeries such as Shaw Island; therefore, Steller sea lions haulouts would not be disturbed by the noise or presence of aircraft. Scattered records of individual Steller sea lions have been recorded around Amakdedori port, and responses of Steller sea lions to aircraft would be limited to a few individuals in the vicinity. Although there is vulnerability and potential for pups to be trampled by adults if panicked from low-flying aircraft, the port area is not known to support Steller sea lion pups, and no haulouts or rookeries are beneath the projected flight path into and out of Amakdedori. Aircraft flying overhead and landing at Amakdedori are not expected to cause more than a temporary disturbance to Steller sea lions, should they occur in the nearby vicinity.

The magnitude and extent of impacts to Steller sea lions from the physical presence of project vessels and aircraft would be disturbance during foraging in the area around Amakdedori port, the lightering locations, and on the vessel routes. The duration of the impact on Steller sea lions from vessel disturbance would be long-term, lasting for the life of the project, but would be expected to occur infrequently, while vessels are transiting between the port and lightering locations, and as vessels transit past haulouts and rookeries outside of the vessel routes. The duration of impacts from aircraft would be temporary, during construction of the port and port access road. Once the port and access road are complete, aircraft flights into Amakdedori port would be restricted to emergencies only.

Injury and Mortality

Vessel Collision

Injury or mortality of Steller sea lions as a result of collisions with project vessels has a low potential to occur during construction and operations of the port. Although pinnipeds are less susceptible to vessel strikes than other marine mammals, in part because of their visual awareness both above and below the water, one vessel collision with a Steller sea lion in Cook Inlet was reported near Homer in 2002, approximately 80 miles east of Amakdedori port (NMFS 2017a). There are no haulouts or rookeries near the port area, and vessels would be traveling at slow speeds (less than 10 knots) between the port and lightering locations, and animals in the water could be avoided. The only haulout in the western side of lower Cook Inlet is Shaw Island, which is south, and away from direct shipping routes between the port and lightering locations. There is a potential for increased vessel collisions with ships coming into Cook Inlet and then heading towards the port if Steller sea lions are in the water transiting to and from Shaw Island. Because ships would be transiting up the center of lower Cook Inlet (in established shipping lanes) before turning west into Kamishak Bay, vessels would pass by Shaw Island several miles to the north. The extent of potential encounters between project vessels and Steller sea lions would range from Amakdedori port to the lightering locations, and then east to the Kenai Peninsula along the natural gas pipeline corridor (only during one summer of construction). Encounters could occur over the long-term, lasting from construction through the life of the project as vessels transit between the port and lightering locations. However, injury and mortality from vessel collisions are low, given the slow speeds of project-related vessels and mitigation measures that PLP would employ through consultation with NMFS.

There would be a low potential for vessels to strike Steller sea lions that are swimming through the vessel routes while concentrate bulk carriers are transiting past. Because the bulk carriers travel faster (13 to 15 knots) than supply barges, there is an increased risk of vessel strike, particularly when bulk carriers are closest to haulouts and rookeries. However, bulk carriers would be traveling in established shipping lanes, and the 27 annual bulk carriers expected during operations add a small percentage to the overall vessel traffic in the area. The risk to Steller sea lions from project vessels would remain low, but would last for the life of the project, and the extent would include the vessel routes.

Entanglement

Steller sea lions are unlikely to become entangled in the 2-inch mooring anchor chain at the lightering locations. According to Benjamins et al. (2014), pinnipeds (which include Steller sea lions) have the least risk of inadvertently becoming entangled in moorings associated with marine renewable energy devices. Pinnipeds have acute mechanosensitivity through their whiskers that allows them to detect wakes formed downstream of a rope, mooring, or cable (Benjamins et al. 2014). Because the 2-inch chain that would be used to attach the mooring buoys to anchors would be relatively taut and non-kinking, the likelihood of entanglement is negligible.

Habitat Changes

The magnitude and extent of impacts from project construction would be permanent loss of Steller sea lion foraging habitat in the vicinity of the Amakdedori port, and temporary disturbance along the natural gas pipeline corridor. Seafloor disturbance may limit the foraging quality of the disturbed area during construction of the Amakdedori port, and installation of the pipeline across Cook Inlet from Amakdedori port to the Kenia Peninsula. As detailed in Table 4.25-3, construction of the port would result in a permanent loss of 2.1 acres of benthic habitat based on the caisson footprint. There would be 3.5 acres of habitat that would be modified by the introduction of shade

from the elevated dock, and 0.15 acre of impacts from the lightering locations. Additional temporary impacts to the benthic marine environment would occur from the natural gas pipeline construction. Temporary habitat alteration is not expected to directly affect Steller sea lions because they are highly mobile and rarely feed on benthic fauna. Therefore, they are not likely to be impacted by disturbances to the benthic environment (NMFS 2017c). However, the magnitude and extent of effects from increased turbidity during construction may potentially deter Steller sea lions from accessing prey in the water column. The duration of these effects would be short-term, and last for the duration of construction. Habitat loss from the caisson dock would last for the life of the project.

Food Sources

A discussion of the potential impacts from sound on food sources is provided in Appendix K4.25, Threatened and Endangered Species. Steller sea lions are generalist predators that consume a variety of fish and cephalopods (Pitcher and Calkins 1981). The magnitude and duration of impacts from construction of the Amakdedori port and installation of the natural gas pipeline would be a minor, temporary alteration of Steller sea lion foraging habitat in the form of increased turbidity, and a permanent alteration of foraging habitat from infrastructure placement. Increased turbidity may have temporary, localized impacts on prey species for Steller sea lions during placement of the natural gas pipeline in Cook Inlet. There is nearby suitable habitat where Steller sea lions could forage if temporarily displaced by construction activities. The extent of Steller sea lion prey habitat alteration is expected to be limited to the vicinity of the Amakdedori port site and the natural gas pipeline alignment. The duration of impacts from increased turbidity on Steller sea lion prey would be short-term, occurring only during construction. Increased turbidity from in-water work is expected to last a short time, as the tides and wave action in the marine environment flush the system. Potential impacts to food sources directly within the port footprint would be considered permanent and last for the life of the project.

Critical Habitat

Project activities are anticipated to have no physical impact on Steller sea lion critical habitat because it is outside of areas that would be physically disturbed by the project (the port and lightering locations). Project vessels would transit through the 20-nautical-mile buffer (established to restrict some fisheries activities) placed around major haulouts and rookeries while traveling on proposed vessel routes. This buffer is not a restriction on maritime traffic; the closest a vessel would pass by a haulout or rookery is 5 nautical miles, which is outside of the 3-nautical-mile buffer no-entry zone for rookeries west of 144°W. The project is anticipated to have no impact on federally designated critical habitat for Steller sea lion.

4.25.4.6 Northern Sea Otter

Behavioral Disturbance

Underwater and Airborne Noise

Sea otters are common and abundant in Kamishak Bay throughout the year. Section 3.25, Threatened and Endangered Species, provides an overview of their distribution; they are restricted primarily to nearshore or shallow waters, often in association with underwater features such as reefs. In the analysis area, they are found offshore of Amakdedori port, around the lightering locations, and in the waters between the port and lightering locations. Sea otters also occur in the nearshore waters along the southern side of the Alaska Peninsula, around islands in the Gulf of Alaska, along the Aleutian Islands, and many other areas that would be transited past

by project vessels. Both construction and operation activities have a potential to cause underwater and airborne noise disturbance to northern sea otters. Sea otters are generally resistant to the effects of sound; changes in presence, distribution, and behavior resulting from acoustic stimuli have not been commonly observed (Ghoul and Reichmuth 2012). Sea otters have the potential to be affected by underwater noise associated with increased vessel traffic and construction activities at the Amakdedori port, lightering locations, and natural gas pipeline corridor; with vessel operations at the port and at lightering locations; and from project aircraft using the airstrip near the port site. Houghton et al. (2015) proposed that vessel speed is the most important predictor of received noise levels, with low vessel speeds (such as those expected during project activity) resulting in lower sound levels. Sounds produced by large vessels generally dominate ambient noise at frequencies from 20 to 300 Hz (Richardson et al. 1995a); however, some energy is also produced at higher frequencies (Hermannsen et al. 2014). The effects of noise on sea otters would be a behavioral response (e.g., escape response) or physiological response (e.g., increased heart rate or hormonal stress response) (Atkinson et al. 2009). A discussion on noise levels from vessel and aircraft operations is included in Appendix K4.25, Threatened and Endangered Species.

Studies show that sea otters have similar hearing thresholds in-air and underwater to ottarids (eared seals), and the underwater audiogram shows the typical mammalian U-shape (Ghoul and Reichmuth 2014). The range of best hearing is from 1 to 16 kHz. Sea otter hearing sensitivity is similar to that of the sea lion (Ghoul and Reichmuth 2014), where sea lion's in-air hearing range is 0.250 to 30 kHz, with a region of best hearing sensitivity from 5 to 14.1 kHz (Muslow and Reichmuth 2010). Ghoul and Reichmuth (2016) reported that sea otter hearing is most sensitive underwater at 8 to 16 kHz. Higher hearing thresholds indicating poorer sensitivity were observed for signals below 16 kHz and above 25 kHz (Kastelein et al. 2005).

During construction of the port and port access road, the airstrip at Amakdedori would have 20 to 40 flights per month (average of 5 to 10 flights per week) before Kokhanok can be accessed by road. On final approach or take-off, aircraft would be low above the water, and any sea otters in the immediate vicinity would be exposed to elevated noise levels. If sea otters are hauled out on the offshore reefs in Kamishak Bay, there is a potential for them to be disturbed during aircraft overflights. Several offshore reefs were used by sea otters based on ABR surveys in 2019, with as many as 150 sea otters using one haulout during repeated surveys. Figures and additional information are provided in Section 3.25, Threatened and Endangered Species.

Richardson et al. (1995a) recorded sounds produced by a Bell 212 helicopter during two flights. At the surface of the water, the received sound level from a helicopter flown at 500 feet was 81 dB re 20 µPa, and at 1,000 feet was roughly 75 dB re 20 µPa (Richardson et al. 1995a). Although these levels would make a temporary or permanent threshold shift extremely unlikely (USFWS 2019), there is a potential for disturbance during take-offs and landings. Because loud screams are used to communicate between pups and mothers at the surface (McShane et al. 1995), any loud noises that mask the ability for otters to communicate could have an impact. Because sea otters do not appear to communicate vocally underwater, and do not use sound to detect prey (USFWS 2019), underwater noise from project construction and operations is less likely to impact sea otters.

Sea otters spend a great deal of time at the surface feeding and grooming (Wolt et al. 2012). Therefore, their potential exposure to noise from underwater anthropogenic sound sources is lower than for many other marine mammal species. Most of the noises associated with the project are within the effective hearing range of sea otters (0.125 kHz to 32 kHz; Ghoul and Reichmuth 2014). Sea otters in close proximity to project-related noise may exhibit a behavioral avoidance response. Construction of the port is anticipated to have the greatest potential noise impact on sea otters. Because there are no noise thresholds established specifically for northern sea otters,

the USFWS uses noise thresholds that have been established by NMFS for pinnipeds (USFWS 2015a). The USFWS recognizes the 160 dB re 1 µPa rms as the Level B disturbance threshold for sea otters for both impulsive and non-impulsive noise types. Based on a recent programmatic consultation between the USACE and USFWS regarding effects to northern sea otters from activities permitted by the USACE, the USFWS found that all in-water use of heavy equipment for manipulating the substrate would result in a monitoring zone radius that could extend out to 984 feet from the sound source (USFWS 2015a). This is the monitoring zone radius that is necessary to ensure that the typical maximum sound production levels reached by heavy equipment manipulating the substrate underwater attenuate to levels below those that are expected to cause injury. This is an appropriate monitoring zone radius because a barge-mounted excavator would be necessary to manipulate the seafloor (to excavate 2 to 3 feet down for each caisson) during placement of the caissons. A similarly sized monitoring area would be monitored during placement of the anchors associated with the lighted navigation buoys.

Noise from anchor handling tugs during installation of the natural gas pipeline and fiber-optic cable could also result in temporary disturbance to sea otters. Based on LGL et al. (2014) a conservative estimate of 188 dB from anchor-handling tugboats, the radius to the 160 dB harassment threshold for sea otters is 243 feet. This is elaborated on in the draft USFWS biological assessment provided in Appendix G. All noise associated with the project (including installation of the natural gas pipeline and fiber-optic cable) would be from continuous sources, and no noise would reach levels considered harmful to sea otters (noise would reach harassment levels only). None of the noise sources would result in Level A harassment or injury to sea otters.

Because northern sea otters in Kamishak Bay have little exposure to vessels, construction activities may temporarily displace otters from feeding or resting areas. The duration of potential impacts from these construction activities would be temporary and short-term, lasting a single June-to-August period during pipeline installation.

Vessel presence and subsequent noise during operations may affect sea otters in the analysis area. Underwater noise from vessels and aircraft would exceed disturbance (Level B) acoustic harassment thresholds. Mitigation and monitoring would be implemented to avoid harassment. The magnitude of impact of the airborne noise during construction to sea otters rafting in the immediate vicinity (especially for otters directly below the flight path) would be a temporary disturbance and lead to departure from the area. During operations, noise from vessels transiting the port and the lightering locations may result in disturbance to sea otters. Some sea otters in eastern Cook Inlet appear to have become tolerant of vessel traffic and noise caused by vessels (USFWS 2019), whereas on the western side of Cook Inlet, operations activities would be a novel disturbance source that is likely to elicit a more intense behavioral avoidance response. Although the western side of Kamishak Bay has a high density of sea otters that have not been exposed to routine vessel traffic, experience from other locations has shown there is a potential for sea otters to eventually habituate or tolerate regular presence of vessels (Calkins 1979). The extent of potential impact from underwater or airborne noise on sea otters would be limited to the port, lightering locations, and vessel routes. Measures to minimize and reduce impacts to northern sea otters are provided in Chapter 5, Mitigation; and Appendix G, ESA Biological Assessment—USFWS.

Physical Presence (Vessel and Aircraft)

Vessel disturbance was ranked low as a threat to recovery, and as ‘low importance’ in the northern sea otter recovery plan (USFWS 2013b). The reaction of sea otters to disturbance: 1) is highly variable between seasons, sexes, and populations; and 2) may be modified by experience (reactions often decline in intensity with habituation and may increase where populations are harassed or hunted) (USFWS 2013b). Although male sea otters sometimes habituate to heavy

boat traffic, female sea otters, particularly those with pups, are sensitive to disturbance. Boat traffic could also disturb the resting patterns of sea otters.

Sea otters spend approximately 80 percent of their time on the water surface (Wolt et al. 2012). Sea otters are slow swimmers relative to other marine mammals and spend much of their time at the surface resting, grooming, and nursing their young. The magnitude of impacts to individual sea otters from the physical presence of project-related vessels would be a modification of behavior. This may include swimming away, submerging underwater, or getting into the water, if the otters were hauled out on land. As described in Section 3.25, Threatened and Endangered Species, the most recent project-specific aerial surveys in March, May, June, and October of 2019 documented hundreds of northern sea otters in Kamishak Bay, with an average of 749 otters per survey (ABR 2019a, 2019b, 2019c, 2019f). Although the locations of otters sifted slightly during surveys, they showed a strong preference for the northern part of Kamishak Bay, especially between Amakdedori and Augustine Island. Operations of the project would add 330 project-related vessel trips annually in the analysis area. Vessel trips between Amakdedori port and the lightering locations would traverse northern sea otter high-density areas, including passing by haulout sites. There are several haulout locations that occur within 1 to 3 miles from where vessels may transit while heading into the port. One of these haulout locations contained 150 northern sea otters during surveys in March and June 2019 (ABR 2019b, 2019c). Because sea otters in Kamishak Bay currently have little exposure to vessel traffic, any repeated disturbance may displace feeding or resting otters (including females with pups) and lead to increased stress. Specific impacts from vessel presence would be disturbance and displacement of sea otters that are hauled out or rafting (USDOI, MMS 2003). Females and pup pairs may be separated due to vessel presence. Impacts to behavior from vessel and aircraft presence are expected to be short-term, while a vessel or aircraft passes by. Aircraft impacts would likely only occur during 2 years of construction for the port, but vessel traffic would last from construction through the life of the project. Currently, mitigation measures in Chapter 5, Mitigation, Table 5-2, include reducing vessel speed to 10 knots in Kamishak Bay. Additional measures may be developed in consultation with the USFWS to reduce impacts to northern sea otters.

Injury and Mortality

Vessel Collision

Vessel strike mortality has been documented across all three stocks of northern sea otters in Alaska. Since 2002, the USFWS has undertaken a health and disease study of sea otters in Alaska to determine cause of death, disease incidence, and status of general health parameters. Of 1,433 necropsies conducted, boat strike or blunt trauma was identified as a definitive or presumptive cause of death in 64 cases (4 percent) (USFWS 2019). In most cases, there was a contributing factor such as disease or biotoxin exposure that made affected individuals more susceptible to boat strike. The likelihood of vessel strikes involving sea otters is primarily related to vessel speed, with most collision reports from small, fast-moving vessels (NMFS 2003). Injury and mortality of sea otters from collisions with vessels has a low potential to occur during construction and operation of the port because sea otters are highly mobile, and vessel speeds would be low (less than 10 knots) around the port and lightering locations, and animals in the water could be avoided. Because sea otters spend a considerable portion of their time at the surface of the water, they are typically visually aware of approaching boats and are able to move away if a vessel is not traveling too quickly (USFWS 2019).

There is additional potential for sea otters to experience vessel collisions with vessels transiting the vessel routes outside of Cook Inlet because they would not be restricted to a 10-knot speed limit. Sea otters are in nearshore waters along the southern side of the Alaska Peninsula, around

Kodiak Island, and along the Aleutian Islands. Most otters remain close to shore within a 66-foot depth contour. Project vessels would not come into waters that shallow; therefore, the potential for project-vessels to collide with sea otters would be minimal.

The probability of project activities causing sea otter/vessel collisions is low. Project work would involve slow-moving vessels that sea otters can generally avoid. The areal extent of encounters between project vessels and sea otters would be concentrated between Amakdedori port and the lightering locations, with the greatest potential for vessel encounters at the alternate lightering due to higher sea otter densities, compared to the immediate vicinity of the port. The duration would be for the life of the project, and the likelihood would be low due to sea otter's ability to avoid vessels, especially those that travel at low speeds. Measures detailed in Chapter 5, Mitigation, Table 5-2, and measures implemented as part of the consultation process would further reduce the potential for vessel collisions.

Entanglement

Northern sea otters are not expected to experience entanglement from the mooring buoy anchor chains. The 2-inch anchor-chain size would keep the chain relatively taut, and reduce the potential for kinking; therefore, the potential for northern sea otters to become entangled in the mooring chain is considered negligible.

Habitat Changes

The construction of the port would result in permanent loss of 2.1 acres of benthic habitat based on the caisson footprint. There would be 3.5 acres of habitat that would be modified by shading from the elevated dock. There would be additional temporary habitat modification during installation of the natural gas pipeline, as detailed below under the critical habitat section.

These activities would change the physical characteristics of localized areas of habitat. Docks can increase seafloor shading, which affects the amount of light penetration on the seafloor. Water quality may be affected by construction causing turbidity. The magnitude and duration of potential effects from increased turbidity would be a reduction in the foraging quality of the disturbed area for a short time during construction, and permanent loss of foraging habitat in critical habitat at the Amakdedori port site. Habitat loss was ranked as 'low importance' in the recovery plan for the southwestern stock of northern sea otters (USFWS 2013b). The extent of the impacts would be limited to the locally disturbed portions of the analysis area, and the duration would be long-term, lasting from construction through the life of the project.

Food Sources

A discussion on the potential impacts from sound on food sources is provided in Appendix K4.25, Threatened and Endangered Species. Sea otters forage in nearshore waters on benthic invertebrates (e.g., mussels, crabs, and clams). Sea otter prey, such as urchins, crabs, and clams, may be impacted by seafloor disturbance from port construction and natural gas pipeline installation. The magnitude and duration of impacts from construction of the Amakdedori port and installation of the natural gas pipeline would be a temporary alteration of sea otter foraging habitat in the form of increased turbidity, and a permanent alteration of sea otter foraging habitat from infrastructure placement. Increased turbidity may have temporary impacts on important prey species for sea otters. Because the area that would temporarily be disturbed during pipeline installation is a small fraction of Cook Inlet, there are other nearby locations where sea otters could forage, and they are not expected to experience loss of foraging opportunities. The extent of sea otter prey habitat alteration is expected to be limited to the vicinity of the Amakdedori port site and the natural gas pipeline corridor. The duration of impacts from increased turbidity on sea

otter prey would be short-term, occurring during construction. The magnitude and extent of effects from seafloor disturbance of prey would be a limitation in the foraging habitat quality of the disturbed area during construction of the Amakdedori port, and the pipeline corridor across Cook Inlet. Increased turbidity from in-water work is expected to last a short time, as the tides and wave action in the marine environment flush the system.

Critical Habitat

The project is in Critical Habitat Unit 5: Kodiak, Kamishak, and Alaska Peninsula. Critical habitat is also in the western vessel route through the Gulf of Alaska and out to the Aleutian Islands. Construction of the dock at the port, lighted navigation buoys, and construction of the natural gas pipeline have the potential to adversely affect critical habitat, but the vessel routes would have no impact on critical habitat. Northern sea otter critical habitat primary constituent elements (discussed in detail in Section 3.25, Threatened and Endangered Species) could be directly affected through construction of the port facilities. The magnitude of impacts to critical habitat from construction of the port would be a direct loss and permanent modification of 2.1 acres of benthic habitat from construction of the caisson dock, and 4.4 acres of temporary disturbance during installation. The above-water footprint of the port would be 3.5 acres; although sea otters would be able to swim or dive between the caissons, the habitat shading may impact sea otter prey species. There would be 76.2 acres (10.7 linear corridor miles) of temporary impacts to critical habitat through installation of the natural gas pipeline. The duration of impacts from port construction would be long-term, lasting through the life of the project. The extent of effects would be localized around the port.

4.25.4.7 Steller's Eider

All phases of mine site activities are anticipated to have no direct or indirect impacts on Steller's eider (*Polysticta stelleri*) because the species is not known to breed, stage, or migrate through the mine site. Steller's eiders are generally not found more than 60 miles inland, and therefore would be unlikely to occur at the mine site (USFWS 2002). Steller's eiders were never detected inland during any of the project-specific biological surveys conducted by ABR, and there is no indication that the species historically occurred around the mine site. Therefore, potential impacts to Steller's eiders landing on the pit lake, tailings ponds, or other areas of ponded water in the mine site are not expected, and are not discussed herein.

In addition, no impacts to Steller's eiders are anticipated from the terrestrial portion of the transportation corridor or natural gas pipeline corridor (the portion that occurs west of Cook Inlet), because there would be no elevated structures that could pose a collision hazard, such as powerlines. Towers, powerlines, and other overhead structures may pose a collision hazard to Steller's eiders because they are known to fly low and fast over land and water, and are believed to migrate at night (USFWS 2014e). A migration study conducted between 2002 and 2004 of all four eider species around Northstar Island (offshore in the Beaufort Sea west of Prudhoe Bay, Alaska) documented eiders flying at a mean altitude of approximately 20 feet above ground/sea level in a straight-line direction, and at high mean velocities around 45 miles per hour (Day et al. 2005). This low, fast, and direct method of flying increases the risk of colliding with structures that are near the ground level.

The only project-related collision hazards are at the port and project components in Kamishak Bay. The extent of impacts to Steller's eiders would be the potential for collision with moored vessels at lightering locations in Kamishak Bay, the 100- to 150-foot monopole communication tower and port structures at Amakdedori, and potential collisions with the lighted navigation buoys. Steller's eiders are known to molt and winter in the nearshore waters of Kamishak Bay (generally from late November through early April). They undergo a 3-week flightless molt (which may occur

anytime from late July through late October) in nearshore waters, including Kamishak Bay. In Kamishak Bay, the primary molt location is around the Douglas River Shoals area, approximately 17 miles south of Amakdedori port, where birds have been recorded beginning in late August through early September. Birds tend to move farther north up the western side of Cook Inlet later in the fall and winter, as stormy weather conditions and icing begin to push birds north. Therefore, birds using the nearshore waters around Amakdedori port and farther north are generally observed later in the season after molt is complete. The most recent aerial surveys conducted by ABR on October 30, 2019 documented one small group of Steller's eiders on the southern side of Augustine Island.

Potential impacts to Steller's eiders from port construction noise are not considered herein because the in-water portion of the port would be constructed primarily during one May-to-September period, when Steller's eiders are generally not present. Although Steller's eiders may occur at Douglas River Shoals beginning in mid-August, they have not been detected around the port location until later in winter. Impacts from construction of the natural gas pipeline are also not expected to occur, because construction is anticipated to occur primarily during a single June-to-August period, when Steller's eiders are primarily not present in Cook Inlet. In addition, the natural gas pipeline corridor does not traverse areas where Steller's eiders commonly molt or winter. Potential impacts to eiders from vessel and aircraft noise are discussed under behavioral disturbance, below.

Behavioral Disturbance

Steller's eiders wintering in Kamishak Bay could be disturbed by aircraft and vessels. Studies on Steller's eiders show variable degrees of tolerance to vessel traffic. They commonly overwinter in areas of high activity near the Homer Spit and the Unalaska airport, and do not flee in response to human activities on adjacent shorelines; however, they have been observed to be sensitive to boat traffic in Izembek Lagoon (USFWS 2012g). In Unalaska, the USFWS has observed that Steller's eiders move and maintain a distance of at least 328 feet from humans (USFWS 2007). In a study of responses of wintering waterfowl to aircraft traffic, Ward and Stehn (1989) found that Steller's eiders flushed when aircraft came within approximately 984 feet. Disturbance from boat traffic can cause Steller's eiders to fly away from preferred foraging and resting sites, thereby disrupting foraging or resting periods. Disturbance of sufficient frequency, duration, or severity can lower individual fitness through increased time spent in flight, and reduced time spent feeding or resting (USFWS 2012g).

Studies have documented a variety of behavioral responses by waterbirds to vessel-related disturbance, including increased alert behavior, flight, swimming, and a reduction in foraging (Agness 2006). Waterbird responses to vessel traffic may be dependent on species, biological cycle (e.g., breeding, migrating, stopover, and wintering), and/or vessel attributes (e.g., vessel type, size, speed, and distance from the birds). Schwemmer et al. (2011) found that flush distances of four sea duck species differed substantially, with flush distance being positively related to flock size. The study also found indications of habituation in sea ducks in areas of channeled traffic. Because vessel traffic would follow established travel lanes and would approach nearshore habitats (used by molting Steller's eiders) slowly (less than 10 knots) as they near the port, the potential for disturbance or collisions in the vicinity of Amakdedori port would be limited. The majority of Steller's eiders in the area molt and winter approximately 17 miles south of Amakdedori port around the Douglas River Shoals (Larned 2006). Although Larned (2006) documented small groups of Steller's eiders around Amakdedulia Cove, these small groups would likely move out of the way while vessels approached the port. Steller's eiders prefer nearshore areas where water depths are shallow, and vessel speeds are slower. Vessel and aircraft traffic is anticipated to occur year-round at the port. The summer is the only season when Steller's eiders

are not expected to be in the nearshore areas around the port. Molting Steller's eiders may begin to appear in Kamishak Bay (primarily around the Douglas River Shoals area) in July, with the peak of molting between August and October. Wintering Steller's eiders are anticipated to reach their highest numbers in late winter and early spring, prior to their departure for the Alaska coastline and northern spring migration.

Vessel speeds would be slow (i.e., less than 10 knots) while approaching and departing the port, providing time for any Steller's eiders in the immediate vicinity to move out of harm's way. Steller's eiders are known to become accustomed to the presence of vessels at ports where they winter (USFWS 2012h). Therefore, the magnitude, duration, and extent of effects of project vessels on Steller's eiders would be a short-term, temporary disturbance around the Amakdedori port while vessels are transiting the port. In addition, aircraft flying into and out of the airstrip may cause Steller's eiders to avoid the area at the eastern end of the runway (closest to Cook Inlet), and any areas directly under the flight approach path. Depending on the altitude of aircraft above the water (when landing from the east), Steller's eiders are anticipated to fly, dive, or move out of the way while aircraft approach the airstrip. Based on a study of king eiders (*Somateria spectabilis*) (an appropriate surrogate for Steller's eiders) in western Greenland, they dove underwater when aircraft approached, and over 50 percent remained submerged until the plane passed (Mosbech and Boertmann 1999). King eiders appeared sensitive to aircraft engine noise, and flushed, dove, or swam away, sometimes leaving the area for several hours (Frimer 1994). Steller's eiders are anticipated to return to the area from which they were flushed after vessels or aircraft have passed. Because eiders typically fly close and fast over the water's surface at low altitudes (i.e., less than 20 feet) (Day et al. 2005), they are unlikely to be struck by aircraft landing at the port locations.

Although the majority of molting and wintering Steller's eiders tend to prefer shallow waters around Douglas River Shoals, a few small flocks of eiders may occasionally forage in the nearshore waters around the port. The magnitude and duration of impacts from project vessels would be behavioral disturbance during construction of the port and natural gas pipeline, which would occur primarily during summer months when Steller's eiders are absent. The extent of impacts would be limited to the area immediately around the port, with shallow waters and reefs where eiders may forage. The duration of behavioral disturbance and avoidance due to operation of vessels between the port and lightering locations would be for the life of the project, but only between fall and early spring when Steller's eiders are present in the analysis area. The duration and extent of impacts from aircraft overflights would be temporary and limited to the construction of the port and port access road.

Injury and Mortality

Because Steller's eiders tend to fly low and fast over water, they are susceptible to collisions with stationary or slow-moving objects, especially during periods of poor visibility. The chance of collision increases with fog or darkness, especially in areas that have lights that could attract and disorient birds. Steller's eiders are believed to be attracted to artificial light, which may increase their risk of collision with structures and vessels (USFWS 2014e). Steller's eiders have a potential to collide with the lighted navigation buoys and port structures (including the communication tower at Amakdedori port). The magnitude and extent of impacts would be the potential for direct injury and mortality to Steller's eiders from collision with the port structures and vessels using the port. Steller's eiders have been documented to collide with illuminated crab boats, and powerlines and towers, especially during periods of inclement weather (USFWS 2012g). Permanent project structures mounted on the causeway and or dock would include a fuel pipeline for unloading barges, a powerline for vessel shore power, a water supply line for firefighting, and illumination and navigation lights. Although most of these components would be along the causeway at

ground level, any lights on the causeway, or other elevated structures, may pose a collision hazard in an area where there is currently no artificial light or structures.

The communications tower inside the port facilities at Amakdedori may also pose a collision hazard to eiders. There is evidence that lights on structures, particularly steady-state red lights, can result in disorientation and increased collision risk for avian species (Manville 2000). In accordance with FAA and USFWS guidelines, the tower would be marked with high-visibility paint bands and may include flashing red lights at the top if required. The eider flight path to molting and wintering areas in Kamishak Bay is currently unknown; therefore, the potential risk of collision is unknown. In addition, the large bulk carrier ships that would be moored at the lightering locations, along with any cranes to load concentrate into the bulk carrier ships, would pose a collision hazard for eiders flying in Kamishak Bay. This is especially important if the bulk carrier ships have large flood lights that are not adequately shielded and point inward, away from the open ocean.

The USFWS calculated the collision risk for Steller's eiders in the Chukchi Sea for the installation of subsea fiber-optic cable based on actual collisions events during exploratory drilling operations in 2012 (USFWS 2016d). Although those numbers are not completely comparable to the analysis area, they provide insight into collision risks for an area with high eider abundance. The collision risks were determined to be very low for Steller's eiders. Per the project description in Chapter 2, Alternatives, bulk carriers (which pose the greatest collision risk to Steller's eiders due to their large size, high gunwales, crane, and external lights) would be moored at lightering locations for 4 to 5 days, with 27 annual trips, which would extend for the life of the project. There would also be 33 supply barges that annually dock at Amakdedori port that would present an additional collision hazard.

Injury or mortality to molting and wintering Steller's eiders has a low potential to occur during construction of the port and natural gas pipeline because construction would primarily occur when Steller's eiders are absent. Construction of the pipeline is projected to wrap up in September, and Steller's eiders begin to arrive in the area in mid-August; therefore there is a potential for temporal overlap. During project operations there is an increased potential for eider injury or mortality, primarily from collision with the port infrastructure and vessels. The potential for collision would increase during migration periods and inclement weather, including low fog. The extent of impacts would be limited to the port area and lightering locations, with the duration lasting for the life of the project.

Habitat Changes

There is no Steller's eider critical habitat in Cook Inlet, and the vessel routes outside of Cook Inlet would have no impact on critical habitat on the northern side of the Alaska Peninsula. The magnitude and extent of impacts due to the construction of the Amakdedori port would be a loss of nearshore foraging habitat for Steller's eiders. The species generally forages for a variety of benthic organisms (including bivalves, gastropods, and crustaceans) in marine waters up to 30 feet deep (65 FR 13262). Because Steller's eiders prefer to winter in shallow waters, they are usually found within 1,200 feet of shore (USFWS 2002). The magnitude of impacts from construction of the port would be loss of 3.5 acres of foraging habitat from the above-water portion of the port, which includes the caisson footprints. There would be additional acreage (potentially similar to the acreage of habitat disturbance for northern sea otters) of temporary impacts to benthic habitat through installation of the natural gas pipeline in the nearshore environment. Steller's eiders may eventually habituate to the presence of the port, as shown in other studies. One study in Norway documented Steller's eiders frequently foraging between fishing vessels inside several harbor complexes (Fox et al. 1997). In addition, Steller's eiders have been observed foraging and resting adjacent to docks at Sandpoint, Alaska (USFWS 2012h). Less than

1 percent of the available foraging habitat in Kamishak Bay would be impacted. The extent of the impacts would be limited to the small in-water footprint of the port; the duration would be for the life of the project.

4.25.4.8 Short-Tailed Albatross

The short-tailed albatross was considered for inclusion due to its presence in Alaskan waters in areas that overlap with proposed project shipping routes. Although short-tailed albatross have not been recorded in Cook Inlet, they are included in the EIS because they may be encountered by project-related offshore vessel traffic in the Gulf of Alaska, along the Alaska Peninsula, and in the Bering Sea. Project vessels have a potential to disturb short-tailed albatrosses that are resting on the ocean's surface or foraging in the shipping lanes. During the non-breeding season, short-tailed albatross range widely, foraging in the Bering Sea and around the Aleutian Islands at the water's surface mainly at night or twilight, and rest during the day. Albatrosses are known to fly around vessels (especially fishing vessels), and there is a collision risk at night and during periods of inclement weather. The shipping lanes that project-related vessels would take are used annually by thousands of vessels, and the addition of project-related vessels would add close to a 1 percent increase in existing shipping traffic (based on 2008-2009 traffic volumes [ERM-West Inc. and Det Norske Veritas 2010]), which would add a small increase in the overall collision risk to the species. The magnitude of impacts would be negligible, the duration would last during operations, and extent would encompass mainly the western vessel route.

4.25.5 Alternative 1

There are no new geographical areas in the marine environment of Cook Inlet under Alternative 1 beyond those detailed above for Alternative 1a. The analysis area for Alternative 1 is the same as Alternative 1a, including the vessel routes. The only difference between Alternative 1a and Alternative 1 with a potential to impact TES and their critical habitats are two different dock designs or variants at Amakdedori. The on-land portion of the port on the beach and bluff at Amakdedori would be the same regardless of the variant. The two in-water variants of the port are:

- An earthen causeway and wharf (sheet pile dock structure)
- A pile-supported dock variant

Both port variants would result in different impacts to the marine environment, including the amount of disturbance to the benthic marine environment and the amount of noise generated during construction. The earthen causeway and wharf would have the greatest level of disturbance to the benthic marine environment (largest in-water footprint), followed by the pile-supported (48-inch diameter piles) dock variant. Both the earthen causeway and pile-supported dock variants would generate differing levels of sheet/pile-driving associated underwater noise. Once construction of the port is complete, port operations would be the same regardless of dock construction design. There would be no change in the level of vessel or aircraft traffic, which was previously analyzed under Alternative 1a. There would be no change in the installation of the natural gas pipeline, and it would follow the same route detailed above for Alternative 1a. Impacts to TES from vessel and aircraft traffic and installation of the natural gas pipeline and fiber-optic cable were previously detailed under Alternative 1a and are not repeated here. In addition, all dock variants would require two lighted navigation buoys (3 feet in diameter) located on the subtidal reefs framing the entrance to the Amakdedori port. The buoys would be anchored to the reef using 3-foot-cubed concrete block-anchors, with an anchoring design that prevents excessive anchor chain drag or swinging (PLP 2018-RFI 093). Permanent structures mounted on the causeway and or dock would include a fuel pipeline for unloading barges, a powerline for vessel shore power, a water supply line for firefighting, and illumination and navigation lights. No

permanent cranes or fuel storage would be located on the dock. Table 4.25-4 summarizes the construction impacts from the two dock designs, because all operations impacts are previously detailed under Alternative 1a.

Table 4.25-4: Summary of Construction Impacts for the Dock Variants Analyzed under Alternative 1

Project Component[1]	Acres of Impacts[2]
Construction	
Earthen Causeway and Wharf (Sheet Pile Dock)	10.7 acres (permanent in-water footprint) plus 2.9 acres of temporary impacts from a 30-foot construction buffer around the permanent in-water footprint. These acreages represent permanent and temporary impacts to Cook Inlet beluga whale and northern sea otter critical habitat.
Pile-Supported Dock Variant	3.1 acres (which includes 0.07 acre from the combined footprint of all pilings) plus 5.7 acres of temporary impacts from a 30-foot construction buffer. These acreages represent permanent and temporary impacts to Cook Inlet beluga whale and northern sea otter critical habitat.

Notes:

[1] All other project components in the marine environment of Cook Inlet, apart from the dock variants, are the same as those under Alternative 1a.

[2] Acreages were calculated based on the written description of primary constituent elements (PCEs) of critical habitat designation for Cook Inlet beluga whale and northern sea otter that overlap with the various dock footprints.

Details for the two dock variants are included in Chapter 2, Alternatives. The earthen causeway and wharf (sheet pile dock) (maximum width of 500 feet by 1,200 feet long) would extend from shore out to a marine jetty located in -15 feet mean lower low water. One side of the jetty would be occupied by a roll-on/roll-off barge access berth; a separate berth for loading lightering barges would be on the opposite side. The jetty (maximum width of 120 feet by 700 feet long) is expected to be constructed as a sheet pile cell structure filled with granular material. The pile-supported dock would consist of 76 trestle piles and 177 dock piles, for a total of 253 piles. All piles would be 48 inches in diameter, with a 1.5-inch wall thickness. The piles would be vibrated into place and then driven to refusal with an impact hammer.

The main source of disturbance to TES and their critical habitats would be noise from sheet/pile-driving, and habitat loss. These are the only impacts discussed below per species. Critical habitat is only designated for Cook Inlet beluga whale and northern sea otter around Amakdedori. Although the other TES could forage around the port, the main impacts to TES habitat would apply to beluga whales and northern sea otters.

Behavioral disturbance to TES from airborne noise and physical presence is the same as Alternative 1a, and not repeated here. Likewise, impacts from injury and mortality from vessel collisions and entanglement, and potential impacts on food sources from habitat changes are not repeated below. Only behavioral disturbance from underwater noise and impacts to critical habitat (for species where critical habitat is present in the analysis area) are discussed below.

4.25.5.1 Cook Inlet Beluga Whale

Construction of the earthen causeway and wharf (sheet pile dock) would result in underwater noise from sheet pile-driving and rock laying for the causeway. A summary of NMFS acoustic thresholds for various marine mammals is provided in Table K4.25-1. Thresholds for Level A (injury) acoustic harassment are separated into functional hearing groups, of which beluga whales are considered mid-frequency cetaceans. Thresholds for Level B (disturbance) acoustic harassment do not vary according to species; they are 160 dB rms for impulsive sounds and

120 dB rms for non-impulsive sounds. Potential noise levels from sheet pile-driving are included in Table K4.25-5. To determine the radius from sheet pile-driving where beluga whales may experience non-impulsive Level B disturbance thresholds requires that a variety of factors be known regarding construction materials and techniques. To determine the appropriate radius or buffer that would need to be monitored for beluga whales to minimize harassment during construction of the dock, projects with similar activities in Cook Inlet were assessed. A variety of studies (URS 2007; SFS 2009; Illingworth and Rodkin 2007; Denes et al. 2016) has been conducted to document noise levels from pile-driving activities in Cook Inlet. Although none of these studies are precisely comparable to conditions at Amakdedori, and there is a wide variety of factors that affect the transmission of underwater noise (i.e., environmental factors, water depth, substrate composition, tidal currents), the most conservative model for underwater noise attenuation would yield a maximum radial distance to Level B disturbance threshold of 11.3 miles. This range illustrates a maximum area of sound ensonification that could lead to behavioral harassment of beluga whales, depending on the type of sheet pile-driving during construction. This distance would require monitoring to ensure beluga whales are not present during sheet pile-driving construction activities to minimize harassment. The magnitude of noise levels exceed NMFS disturbance thresholds (provided in Table K4.25-1), but mitigation measures would reduce Level A and Level B harassment. The extent of potential impacts to beluga whales would be localized to the immediate vicinity of the causeway. Because construction of the port would occur during the summer months, when beluga whales are generally in the upper portion of Cook Inlet, the occurrence of beluga whales around the port during summer construction is unlikely. Measures to avoid and minimize impacts to Cook Inlet beluga whales would be determined through consultation with NMFS.

A second potential dock for Amakdedori port would be a Pile-Supported Dock Variant. Under the Pile-Supported Dock Variant, the underwater noise associated with pile-driving could result in impacts to beluga whales. Underwater sound from pile-driving varies with size and type of piles and type of hammer. Impact pile-driving results in higher peak sound levels, which have greater potential for injury and disturbance; whereas vibratory pile-driving results in lower overall sound levels, with potential for disturbance (Level B), but typically not injury (Level A). Illingworth and Rodkin (2007) estimated the sound levels for impact pile-driving measured from 33 feet away for 48-inch-diameter steel pipe at 210 dB peak levels, 200 dB rms, and 185 dB SEL. The distance to Level B noise disturbance impacts could extend out to 2.9 miles from the port for 48-inch impulsive impact pile-driving. Pile-driving activity is a well-studied acoustic disturbance of primary concern for the impact on marine mammals, and NMFS and USFWS currently evaluates any IHA application for pile-driving in Cook Inlet, with particular concern to potential impacts on beluga whales, and multiple mitigation measures are requested as part of the permitting process (Castellote et al. 2019).

Impacts to critical habitat are detailed above in Table 4.25-4, depending on the dock variety. All other impacts to Cook Inlet beluga whales are anticipated to be the same as Alternative 1a. The magnitude of impacts would be minor loss of habitat from construction of the port and disturbance (from vessels and aircraft) during construction and operations. The duration would span from construction through the life of the project, and the extent would be the analysis area with concentrated vessel traffic between the port and lightering locations.

4.25.5.2 Humpback Whale

Construction of the sheet pile dock structure filled with gravel material (earthen causeway) would result in underwater noise from sheet pile-driving and rock laying for the causeway. Humpback whales may experience noise levels that exceed NMFS noise thresholds during sheet pile-driving (if they are present in the immediate vicinity during the sheet pile-driving), which are detailed in

Table K4.25-6. The levels of noise from sheet pile-driving are detailed above for Cook Inlet beluga whales and are expected to exceed disturbance (Level B) and injury (Level A) acoustic harassment thresholds during construction, as defined by NMFS and USFWS, by the time they reach offshore areas where humpback whales may occur. The extent of potential noise impacts to humpback whales would be localized to the immediate vicinity of the causeway. Measures to avoid and minimize noise impacts to Cook Inlet beluga whales would be determined through consultation with NMFS.

Construction noise associated with the Pile-Supported Dock Variant would have the greatest potential of inducing behavioral responses from humpback whales. Construction of a Pile-Supported Dock Variant may result in impacts from an increase in underwater noise associated with pile-driving. Underwater sound from pile-driving varies with size and type of piles, and type of hammer. Impact pile-driving results in higher peak sound levels, which have greater potential for injury and disturbance; whereas vibratory pile-driving results in lower overall sound levels, with potential for disturbance, but typically not injury. Details of the radii where humpback whales may experience harassment, if present during pile-driving, are detailed above for Cook Inlet beluga whales. Potential noise levels from pipe-pile-driving are included in Table K4.25-7. Under the Pile-Supported Dock Variant of Alternative 1, the duration of impacts to humpback whales would be a short-term exposure to noise from pile-driving during the 2 years of summer construction. The low-frequency, percussive noise produced by pile-driving would be detectable to humpback whales at a distance of several miles. The magnitude of noise from pile-driving would exceed disturbance (Level B) and injury (Level A) acoustic harassment thresholds as defined by NMFS. Underwater sound levels from pile-driving would be further analyzed in ESA consultation and MMPA consultation. The extent of potential impacts to humpback whales would be localized to the immediate vicinity of the port. Measures to avoid and minimize impacts from pile-driving activities to humpback whales would be determined through consultation with NMFS.

There are no anticipated impacts to proposed critical habitat because the habitat occurs farther offshore. All other impacts to humpback whales are anticipated to be the same as Alternative 1a. The magnitude of impacts would be disturbance (from vessels and aircraft) during construction and operations. The duration would span from construction through the life of the project, and the extent would be the analysis area, with concentrated vessel traffic between the port and lightering locations.

4.25.5.3 Fin Whale

Construction of the port site under the sheet pile dock and Pile-Supported Dock Variant have a potential to cause harassment from noise, as detailed previously for Cook Inlet beluga whale and humpback whale. Sheet- and pile-driving noise may exceed disturbance and injury thresholds, as defined by NMFS. Underwater sound levels from sheet and pile-driving vary with size, as well as the size and type of hammer, and would be further analyzed in ESA and MMPA consultation. Approximate levels of noise produced by pile-driving are provided in Appendix K4.25, Threatened and Endangered Species.

There are no anticipated impacts to habitat for fin whales, because there is no critical habitat in the analysis area, and the shallow waters around the port are unlikely to be used by fin whales. All other impacts to fin whales are anticipated to be the same as Alternative 1a. The magnitude of impacts would be disturbance (from vessels and aircraft) during construction and operations. The duration would span from construction through the life of the project, and the extent would be the analysis area, with concentrated vessel traffic between the port and lightering locations.

4.25.5.4 Blue, Sperm, Sei, Gray, and North Pacific Right Whales

Five endangered whale species have a potential to occur in the project shipping routes in the Pacific Ocean, including the Gulf of Alaska, along the Aleutian Islands, and the Bering Sea. These species do not occur in Cook Inlet, and impacts from construction of the two dock variants would not extend into areas south of Cook Inlet where these whale species may be found. The same impacts from vessels (noise, physical disturbance, and potential for injury and mortality) previously detailed under Alternative 1a have a potential to occur for blue, sperm, sei, gray, and North Pacific right whales, and are not repeated here. The main potential impacts to listed populations of these whale species is behavioral disturbance, including disturbance from underwater noise from project vessels, and a potential for injury and mortality from vessel strikes. All potential impacts would have a low magnitude; the duration would last primarily during operations, when concentrate bulk carriers are transiting the vessel routes; and the extent would encompass the vessel routes.

4.25.5.5 Steller Sea Lion

Sea lions are cautious by nature, and loud, pulsed, frequent, or unfamiliar noises, such as those caused by construction of Amakdedori port, could disrupt resting sea lions or animals foraging near the sound source (NMFS 2005a). Under the sheet pile dock and pile-supported dock variants, Steller sea lions may experience behavioral changes due to short-term exposure to underwater and airborne noise from sheet or pile-driving activities during the 2 years of summer construction. Sheet or pile-driving noise would exceed disturbance (Level B) and injury (Level A) acoustic harassment thresholds as defined by NMFS, outlined in Table K4.25-1. The range to Level B harassment levels would be similar to those detailed above, and range from 0.6 mile for sheet pile to 2.9 miles for 48-inch impulsive pile-driving activities. Underwater sound levels from sheet or pile-driving vary with size, as well as the size and type of hammer, and would be further analyzed in consultation with NMFS. Noise impacts could occur in the vicinity of the port. However, based on survey data detailed in Section 3.25, Threatened and Endangered Species, there are only a few scattered records of Steller sea lions in the general area of the port, and it does not appear to be a major use area. The major haulouts and rookeries are many miles away near the mouth of Cook Inlet. Data from ABR surveys during spring and summer 2018 in Kamishak Bay incidentally detected several Steller sea lions (ABR 2018b). These observations were south and west of Augustine Island, including reefs and shoals close to Amakdedori port. Recent data from March, May, June, and October of 2019 aerial transect surveys (conducted by ABR for northern sea otters and to document haulout locations) detected seven Steller sea lion individuals during the May survey, with several of them hauled out. These individuals were detected around the southern side of Augustine Island and around Nordyke Island (ABR 2019b).

There are no anticipated physical impacts to critical habitat for Steller sea lions, and as detailed under Alternative 1a, above, the closest that vessel traffic would come to haulouts and rookeries is approximately 5 nautical miles. There would be loss of foraging habitat in the nearshore environment from construction of the port, depending on the dock variety selected. All other impacts to Steller sea lions are anticipated to be the same as Alternative 1a. The magnitude of impacts would be minor loss of benthic marine foraging habitat and disturbance (from vessels and aircraft) during construction and operations. The duration would span from construction through the life of the project, and the extent of habitat loss would be at the port, but disturbance could extend throughout the analysis area from transiting project vessels.

4.25.5.6 Northern Sea Otter

Construction of the sheet pile dock would result in underwater noise, with USFWS disturbance thresholds detailed in Table K4.25-1 in Appendix K4.25, Threatened and Endangered Species. The Pile-Supported Dock Variant would have slightly higher anticipated levels of noise due to pile-driving activities compared with the earthen causeway/sheet pile dock. Underwater sound from pile-driving varies with size and type of piles and type of hammer. Impact pile-driving results in higher peak sound, which has greater potential for injury and disturbance; whereas vibratory pile-driving results in lower overall sound levels, with potential for disturbance, but not injury. The USFWS recognizes the 160 dB re 1 µPa rms as the Level B disturbance threshold for sea otters for both impulsive and non-impulsive noise types. Based on a recent programmatic consultation between the USACE and USFWS regarding effects to northern sea otters from activities permitted by the USACE, the USFWS recommends a monitoring radius centered on the noise source of 984 feet for in-water vibratory pile-driving, which includes sheet pile of any size (USFWS 2015). This would be the monitoring radius that would be monitored for the sheet pile dock. For the Pile-Supported Dock Variant, in-water impact pile-driving for round or H pile greater than 36 inches with sound attenuation devices would result in a 1.2-mile-radius hazard area centered on the noise source (USFWS 2015). For round or H pile greater than 36 inches without sound attenuation devices, the USFWS should be consulted. Mitigation measures to reduce impacts during pile-driving, such as shutting down when sea otters are observed in established monitoring zones, would minimize the potential for injury, and would reduce disturbance, as detailed in the biological assessment (Appendix G).

Impacts to northern sea otter critical habitat are detailed in Table 4.25-4. There would be loss of foraging habitat in the nearshore environment from construction of the port, depending on the dock variety selected. All other impacts to northern sea otters are anticipated to be the same as Alternative 1a. The magnitude of impacts would be minor loss of critical habitat encompassing benthic marine foraging habitat, and disturbance (from vessels and aircraft) during construction and operations. The duration would span from construction through the life of the project, and the extent of habitat loss would be at the port, but disturbance could extend throughout the analysis area from transiting project vessels.

4.25.5.7 Steller's Eider

Because Steller's eider occur in Kamishak Bay from fall through late winter/early spring, they are unlikely to occur around Amakdedori during the summer construction months. There is a potential for overlap in August and September, when summer construction would be wrapping up, and the first Steller's eiders arrive at Douglas River Shoals to molt. Data presented in Section 3.25, Threatened and Endangered Species, show that Steller's eiders normally do not occur farther north in Kamishak Bay, including around Amakdedori, until later in winter from December through April. Therefore, Steller's eiders are not anticipated to be present during summer construction of either dock. Impacts to Steller's eiders under this Alternative would be similar to those described under Alternative 1a. Potential noise impacts from sheet/pile-driving is anticipated to have no effect on the species. Loss of nearshore foraging habitat is detailed above in Table 4.25-4. All mitigation measures developed as part of the consultation process would be implemented. The magnitude of impacts to Steller's eiders would be minor loss of nearshore foraging habitat by construction of the port. The extent would encompass the in-water portion of the port and vary depending on the dock design selected. The duration of impacts would last for the life of the project, because the port would remain in place beyond closure to facilitate post-closure and reclamation activities.

4.25.5.8 Short-Tailed Albatross

There would be no additional potential impacts to short-tailed albatross beyond those detailed above for Alternative 1a.

4.25.6 Alternative 2—North Road and Ferry with Downstream Dams

As detailed in Chapter 2, Alternatives, Alternative 2 would involve many of the same elements as Alternative 1a and Alternative 1, but shifted north in the analysis area. The port would be at Diamond Point near the intersection of Cottonwood and Iliamna bays, the primary lightering location would be in Iniskin Bay, and the natural gas pipeline corridor and fiber-optic cable would follow a more northerly route above Augustine Island. Only the marine components of Alternative 2 and their potential impacts on TES are discussed, because no TES occur in the terrestrial portions of Alternative 2. Because the same impacts detailed above for TES (behavioral disturbance, injury and mortality, and habitat changes) also have a potential to occur under Alternative 2, only the differences are discussed below. The main differences with Alternative 2 as it relates to TES in Cook Inlet include: there is no airstrip at the port (the airstrip is farther inland at Pedro Bay, away from TES habitat); no caisson dock is being considered (only sheet pile and pile-support dock variants are considered, which is similar to Alternative 1); the port access road would be constructed partially in the intertidal zone around Diamond Point, which would increase impacts to some TES and their critical habitats, periodic dredging (potentially every 5 years) of a navigation channel at the port for vessel ingress/egress would be necessary for the life of the project; there would be no lighted navigation buoys necessary; and the primary lightering location would be in Iniskin Bay, with the alternate location west of Augustine Island (at the same location as Alternative 1a). Furthermore, there is currently a low level of established vessel activity, primarily between Homer and Williamsport, that occurs mainly during the summer months as a route for vessels heading to Bristol Bay. In addition, there is a barge that makes approximately eight trips per month between April through October from Homer to Williamsport delivering fuel and supplies (Eley 2012). Therefore, there is a low level of established vessel traffic in this area. The same vessel routes would be used by concentrate bulk carriers and supply and fuel barges, which are discussed under Alternative 1a. The only difference is that vessels would have to travel slightly farther into Cook Inlet to reach Diamond Point port and would travel on the eastern side of Augustine Island to reach the port.

The same mitigation measures detailed in Chapter 5, Mitigation, Table 5-2 would also apply to Alternative 2. Additional measures would be implemented through ESA and MMPA consultation.

Table 4.25-5 summarizes the construction and operations impacts in Cook Inlet that are anticipated under Alternative 2. Unlike Alternative 1a and Alternative 1, a short portion of the port access road that wraps around the steep rock face of Diamond Point would require fill into the intertidal zone of Iliamna Bay. Blasting of rock and fill into the intertidal zone would impact critical habitat for Cook Inlet beluga whale and northern sea otter. Maintenance dredging of a navigation channel and turning basin would be necessary to maintain adequate depths for the tugboats and barges, especially during low tides. Because the maintenance dredging would occur multiple times over the life of the project, it is considered a permanent impact to species that feed in the benthic environment (northern sea otters and Steller's eiders).

Table 4.25-5: Summary of Construction and Operations Impacts for Alternative 2

Project Component[1]	Impacts[2]
Construction	
Earthen Causeway and Wharf (Sheet Pile Dock) and Port Access Road	37.6 acres (inclusive of the causeway, wharf, and port access road) plus additional temporary impacts from a 30-foot construction buffer around the causeway, wharf, and port access road. In addition, there would be an impact of 57.7 acres to benthic marine habitat from periodic maintenance dredging at the port. These acreages represent permanent and temporary impacts to Cook Inlet beluga whale and northern sea otter critical habitat.
Pile-Support Dock Variant and Port Access Road	35.4 acres (inclusive of the piling footprints [0.15 acre], overhead dock structures [8 acres], and port access road) plus additional temporary impacts from a 30-foot construction buffer around the dock and port access road. In addition, there would be an impact of 57.7 acres to benthic marine habitat from periodic maintenance dredging at the port. These acreages represent permanent and temporary impacts to Cook Inlet beluga whale and northern sea otter critical habitat.
Lightering Locations[2]	The total spread of the anchors per lightering location is approximately 2,300 by 1,700 feet. The total substrate covered by the anchors is 0.15 acre from the combined footprints of all anchors necessary to hold the mooring buoys in place.
Lighted Navigation Buoys	None are required.
Natural Gas Pipeline (and adjacent fiber-optic cable)	The maximum corridor width from anchors placed for the pipe-lay barge may extend out to 8,202 feet, spanning the pipeline corridor (depending on the depth of Cook Inlet). On average, the pipeline corridor width would be about 1 mile wide, and include both the physical trenching footprint and the station-holding anchors for the pipe-lay barge. The pipeline would be trenched into the substrate, and result in temporary impacts to approximately 126 acres of designated Cook Inlet beluga whale critical habitat, 171 acres of designated northern sea otter critical habitat, and 496 acres of proposed humpback whale critical habitat. The primary noise source during pipeline and fiber-optic cable placement emanates from tugboats during dynamic positioning. It was determined that a 1.7-mile radius was a conservative distance for the extent of underwater noise generated by the tugboats during anchor-handling activities, which exceeds the 120-dB harassment threshold for continuous noise sources. This 1.7-mile radius would encompass all potential noise sources, including those from various dredging technologies and from anchor handling. The average width of impacts (both physical and from underwater noise) would extend approximately 4.4 miles in width along the length of the pipeline though Cook Inlet.
Aircraft Activity	No airstrip is planned at the Diamond Point Port; therefore, no noise impacts are anticipated from project aircraft in the area. There is an existing airstrip farther inland at Pedro Bay that would be used.
Operations	
Vessel Activity	Twenty-seven concentrate vessel shipments would depart the lightering locations annually. Each concentrate vessel would be moored for 4 to 5 days and require 10 lightering trips to fill each concentrate vessel. An additional 33 supply barges (inclusive of 4 fuel barges) would be required annually to supply consumables, fuel, reagent, etc. This equates to 330 annual project-related vessel trips in the analysis area. This would result in an increase of vessel traffic in Cook Inlet by 12.5 percent, and through the Aleutian Islands by 1 percent. There would also be oceanic tugboats to pull the supply barges and port-based ice-breaking tugboats to assist the bulk carrier with mooring, and to move the lightering barges.

Table 4.25-5: Summary of Construction and Operations Impacts for Alternative 2

Project Component[1]	Impacts[2]
	Vessel routes (shipping lanes) would extend north to Nikiski and south through the Gulf of Alaska to West Coast ports, and west along the southern side of the Aleutian Islands through Unimak Pass, into the Bering Sea, and out to the exclusive economic zone. The width of the vessel routes would be approximately 7.4 miles, and encompass the zone of ensonification from project-related vessels.
Port Maintenance Dredging	There would periodic maintenance dredging at the port. Although the frequency of required maintenance dredging is unknown, it could occur every 5 years for the life of the project. This would result in additional habitat impacts, turbidity, and noise impacts during dredging.
Aircraft Activity	No airstrip is planned at the Diamond Point port, and the existing airstrip at Pedro Bay that would be used infrequently.

Notes:

[1] Acreage calculations were determined based on the intersection of project components and geographic information system critical habitat layers from the US Fish and Wildlife Service and National Marine Fisheries Service (depending on the species under their purview), along with the written description of the critical habitat PCEs. The in-water portion of the port for each dock variant and the lightering locations are considered permanent impacts. The 30-foot construction buffer and trenching for the natural gas pipeline are considered temporary impacts.

[2] The primary lightering location is inside of critical habitat for Cook Inlet beluga whale and northern sea otter, but outside of proposed critical habitat for humpback whale. The alternate lightering location west of Augustine Island is outside of Cook Inlet beluga whale and northern sea otter critical habitat, but is inside proposed humpback whale critical habitat.

Similar to Alternative 1, details for the two dock varieties at Diamond Point are included in Chapter 2, Alternatives. Alternative 2 would include an earthen causeway and wharf (sheet pile dock) as the main dock with a pile-supported dock variant. The pile-supported dock variant would be similar to the one under Alternative 1. The conceptual structure would consist of 44 trestle piles and 474 dock piles, for a total of 518 piles. All piles would be 48 inches in diameter, with a 1.5-inch wall thickness. The piles would be vibrated into place and then driven to refusal with an impact hammer.

The main source of disturbance to TES and their critical habitats would be noise from sheet/pile-driving, and habitat loss. These are the only impacts discussed below per species. Critical habitat is only designated for Cook Inlet beluga whale and northern sea otter around Diamond Point. Although the other TES could forage around the port, the main impacts to TES habitat would apply to beluga whales and northern sea otters.

Behavioral disturbance to TES from vessel noise and physical presence is the same as Alternative 1a, and not repeated here. Likewise, impacts from injury and mortality from vessel collisions and entanglement, and potential impacts on food sources from habitat changes are not repeated below. Only behavioral disturbance from underwater noise and impacts to critical habitat (for species where critical habitat is present in the analysis area) are discussed below.

4.25.6.1 Cook Inlet Beluga Whale

Cook Inlet beluga whales have historically been detected infrequently in small groups in Iliamna and Iniskin bays. Because there is no airstrip adjacent to Diamond Point (the airstrip is inland at Pedro Bay), behavioral impacts to beluga whales from aircraft overflights are not anticipated. Potential impacts from underwater noise from construction of the Diamond Point port (both earthen causeway and wharf [sheet-pile dock] or pile-supported dock variants) would be the same as Alternative 1. The earthen causeway dock would result in an underwater noise Level B disturbance radius buffer of 11.3 miles. This range illustrates a maximum area of sound

ensonification that could lead to harassment of beluga whales, depending on the type of sheet pile-driving during construction. This distance would require monitoring to ensure beluga whales are not present during sheet pile-driving construction activities to avoid harassment. There would be additional critical habitat lost and noise impacts from construction of the port access road along the edge of the intertidal zone between Iliamna and Cottonwood bays and Diamond Point. Construction of the port access road would include blasting and placement of material into the intertidal zone along the shore of Iliamna and Cottonwood bays. Blasting would be timed to occur primarily at low tide when the habitat is exposed; potential underwater noise impacts are reduced because construction would occur when water is farther out in the bays.

The Pile-Supported Dock Variant would result in an underwater noise disturbance radius buffer of 2.9 miles for 48-inch impulsive impact pile-driving. Pile-driving activity is a well-studied acoustic disturbance of primary concern for the impact on marine mammals, and NMFS and USFWS currently evaluate any IHA application for pile-driving in Cook Inlet with particular concern to potential impacts on beluga whales, and multiple mitigation measures are requested as part of the permitting process (Castellote et al. 2019).

The magnitude, duration, and extent of impacts from underwater noise due to anchor handling and tugboats operating dynamic positioning during pipeline installation are similar to Alternative 1a, although the pipeline length is shorter under Alternative 2, resulting in less construction time, and therefore, less disturbance expected during the activities. The lightering location under Alternative 2 is in Iniskin Bay, which is in beluga whale critical habitat, and may result in disturbance to critical feeding habitat during the fall months. Unlike Alternative 1a, periodic dredging of the port at Diamond Point would be conducted under Alternative 2. Noise from dredging activities is provided in Appendix K4.25, Threatened and Endangered Species, and in the NMFS draft biological assessment (Appendix H) for Alternative 3, but would apply to dredging at Alternative 2. Maintenance dredging of the navigation channel has the potential to temporarily increase the turbidity, impacting prey species and their detection, but any increase in turbidity is expected to last only a few hours, and dissipate naturally with tidal flow. The extent would be localized around the dredging area. The duration would be throughout the life of the project; dredging would occur initially during port construction, and then dredging would continue for the life of the project as needed, but potentially every 5 years.

In summary, the magnitude of impacts includes potential disturbance from noise and turbidity, minor loss of critical habitat, and changes to forging ability and prey from vessel presence during construction and operations, and continued maintenance dredging in critical habitat. The duration of impacts would be for the life of the project. The extent of impacts would encompass the analysis area, but primarily be restricted to the port, lightering locations, and vessel routes into and out of the analysis area from main shipping lanes in Cook Inlet.

4.25.6.2 Humpback Whale

Humpback whales have been more frequently sighted around the western side of Augustine Island near the alternative lightering location. No humpback whales have been detected in the shallow marine waters in Cottonwood, Iliamna, and Iniskin bays; therefore, the potential for vessel encounters and potential collisions around the port and primary lightering location may be lower under Alternative 2. Impacts from underwater noise from construction of the Diamond Point port (both sheet pile dock and pile-support dock variants) would be similar to those detailed above for Cook Inlet beluga whales, but are unlikely to impact humpback whales because the species has not been detected in the shallow waters where the port would be constructed. The same monitoring radii from noise impacts associated with sheet pile-driving and pile-driving (depending on the dock variety) detailed for Cook Inlet beluga whales would be monitored for humpback whales. Noise impacts from port construction are unlikely to impact humpback whales, because

construction noise impacts would occur in Iliamna Bay, where humpback whales have not been documented. Impacts from underwater noise from anchor handling and tugboats operating dynamic positioning during pipeline installation are also similar between Alternative 1a and Alternative 2, although the pipeline length is shorter under Alternative 2, resulting in potentially less disturbance during activities from less construction time. The construction of the natural gas pipeline corridor would result in 496 acres (68 miles of the pipeline corridor) of temporary impacts to proposed humpback whale critical habitat (for the Mexico DPS). The greatest potential impact to humpback whales would be the increase in vessel traffic. The magnitude of impacts under Alternative 2 would be increased underwater noise (restricted mainly to Iliamna and Iniskin bays) from construction, and increased vessel traffic during construction and operations. Temporary disturbance to prey, primarily during construction of the natural gas pipeline would also be anticipated. The duration of impacts (primarily from increased vessel traffic during operations) would last for the life of the project, and extent would encompass the analysis area (especially the vessel routes south of Cook Inlet).

4.25.6.3 Fin Whale

Fin whales are considered uncommon in Cook Inlet (because it is generally outside of their range) and are unlikely to be encountered in the relatively shallow waters of Iliamna and Iniskin bays; they are more likely to be encountered in the vessel routes outside of Cook Inlet. Impacts to fin whales would be similar to those detailed under Alternative 1a. There would be no aircraft traffic disturbance associated with Alternative 2, because the airstrip is inland; but there would be dredging associated with the construction and operations of the port. The port dredging at Diamond Point would increase the turbidity of the water in Iliamna Bay during dredging activities; however, fin whales would be unlikely in the area due to the shallow water depths. Construction of the port at Diamond Point, regardless of the dock variety selected, would have a low magnitude, because fin whales have not been documented around the port and are unlikely to occur. Hazard radii for underwater noise impacts would be similar to those detailed above for Cook Inlet beluga whales. The installation of the natural gas pipeline would occur during summer months when fin whales have been detected in Cook Inlet; however, none have been detected as far north as the natural gas pipeline corridor (see Section 3.25, Threatened and Endangered Species). Vessels associated with natural gas pipeline installation would be traveling at slow speeds and are not anticipated to pose a collision hazard for fin whales. The loss of habitat from construction and dredging of the port at Diamond Point would not be expected to affect fin whales, because they have not been documented in the area and are unlikely to occur. The greatest potential impact to fin whales would be the increase in vessel traffic. The magnitude of impacts under Alternative 2 would be increased underwater noise (restricted mainly to Iliamna and Iniskin bays, which are likely outside of the range of fin whales) from construction and increased vessel traffic during construction and operations, and temporary disturbance to prey, primarily during construction of the natural gas pipeline. The duration of impacts (primarily from increased vessel traffic during operations) would last for the life of the project, and extent would encompass the analysis area (especially the vessel routes south of Cook Inlet).

4.25.6.4 Blue, Sperm, Sei, Gray, and North Pacific Right Whales

Five endangered whale species have a potential to occur in the project shipping routes in the Pacific Ocean, including the Gulf of Alaska, along the Aleutian Islands, and the Bering Sea. The North Pacific stocks of blue, sperm, and sei whales occur in the EIS analysis area along with the Western North Pacific DPS of the gray whale, and the Eastern North Pacific stock of North Pacific right whale. Because these species do not normally occur in Cook Inlet, where the majority of project-related impacts are anticipated to occur, but their ranges overlap with proposed vessel routes in the Gulf of Alaska, along the Aleutian Islands, through Unimak Pass, into the Bering Sea

and out the exclusive economic zone, these species are discussed collectively herein. The same impacts from vessels (noise, physical disturbance, and potential for injury and mortality) previously detailed above for Alternative 1a have a potential to occur for blue, sperm, sei, gray, and North Pacific right whales. Because these whale species do not occur around the Diamond Point port, there are no additional impacts to these species that are specific to Alternative 2; all impacts are previously discussed under Alternative 1a.

4.25.6.5 Steller Sea Lion

Impacts to Steller sea lions from construction and operations of Alternative 2 would be similar to the impacts analyzed under Alternative 1, because an earthen causeway (sheet pile) dock and pile-supported dock variants are being considered at Diamond Point. Construction impacts would primarily be centered on underwater noise from summer construction of the port, with various monitoring radii detailed above under Cook Inlet beluga whale, depending on the dock variety. Physical impacts to Steller sea lion critical habitat are not expected, because it does not occur in the analysis area; however, project vessels would transit past haulouts and rookeries, but would remain at least 5 nautical miles away. Maintenance dredging activities are likely to cause temporary disturbance to Steller sea lion prey species after increasing turbidity in the water column, thereby displacing fish. In addition, there would be an increase in underwater noise disturbance from maintenance dredging activity for the life of the project, as discussed above. Because no airstrip is proposed near Diamond Point port, impacts from aircraft overflights are not anticipated to occur to the species. Because Steller sea lions have been detected more frequently around Iliamna and Iniskin bay (compared with Amakdedori), especially at the mouth of the bays, impacts from increased vessel activities are likely to cause a greater level of disturbance compared with Alternative 1a. The magnitude of impacts under Alternative 2 would be similar to those discussed in Alternative 1a, and include noise disturbance and changes to forging ability and prey community as a result of maintenance dredging, and a low potential for injury and mortality from vessel collision. The duration would be for the life of the project, and extent would encompass the analysis area.

4.25.6.6 Northern Sea Otter

As detailed in Section 3.25, Threatened and Endangered Species, northern sea otters occur in high densities in and around Iliamna and Iniskin bays. Impacts from underwater noise from construction of the Diamond Point port (either Earthen Causeway Variant [sheet pile dock] or Pile-Supported Dock Variant) would be similar to those detailed above for northern sea otters under Alternative 1. There would be additional critical habitat lost and noise impacts from construction of the port access road along the edge of the intertidal zone between Iliamna and Cottonwood bays and Diamond Point. Construction of the port access road would include blasting and placement of material into the intertidal zone along the shore of Iliamna and Cottonwood bays. Blasting would be timed to occur primarily at low tide when the habitat is exposed; potential underwater noise impacts would be reduced because construction would occur when water is farther out in the bays. Monitoring of areas with elevated noise would be necessary to minimize harassment during summer construction of the port and lightering locations. The magnitude and extent of impacts from underwater noise from anchor handling and tugboats operating dynamic positioning during pipeline installation would be similar to those described under Alternative 1a. The primary lightering location in Iniskin Bay is in northern sea otter critical habitat and important foraging habitat, and would result in disturbance to norther sea otters for the life of the project as vessels transit to and from concentrate vessels moored in Iniskin Bay. Maintenance dredging at the port would result in greater underwater noise and disturbance from vessels, as well as loss of benthic habitat. The operational vessel route is slightly longer under Alternative 2 than under Alternative 1a, potentially resulting in more disturbance and higher vessel collision risk. In

summary, the magnitude of impacts would be disturbance and changes to forging ability and prey community in critical habitat; the duration would be for the life of the project, and extent would encompass the analysis area, primarily in Iliamna and Iniskin bays.

4.25.6.7 Steller's Eider

As detailed in Section 3.25, Threatened and Endangered Species, surveys conducted by Agler et al. (1995), Larned (2006), and ABR (2011a, 2015c) indicate that Iniskin and Iliamna bays provide overwintering habitat for several hundred Steller's eiders (generally from late November through April). Steller's eiders were found primarily in offshore waters in the middle portions of Iniskin and Iliamna bays, and occasionally in nearshore waters. Most birds occurred around a shallow shoal in the lower part of Iniskin Bay, and in the middle of the channel between Cottonwood and Iliamna bays. More specifically, Steller's eiders winter in the waters directly in front of the Diamond Point port location (and in the vessel approach lanes). In addition, eiders winter immediately adjacent to the lightering location in Iniskin Bay. Of the Steller's eiders that winter in Cook Inlet, only a fraction (i.e., less than 1 percent) is assumed to belong to the Alaska breeding federally listed population.

Impacts to Steller's eiders are anticipated to be similar to those from Alternative 1a, except impacts would be shifted north to Iliamna and Iniskin bays. These bays are narrower and may offer more suitable winter protection than exposed waters in Kamishak Bay. In addition, there are no lighted navigation buoys associated with Alternative 2; therefore, they do not pose a collision hazard for Steller's eiders. All potential impacts detailed under Alternative 1a (e.g., behavioral disturbance, habitat changes, and potential for injury and mortality) are similar for Alternative 2.

The primary lightering location at the mouth of Iniskin Bay represents an increased potential for eider collisions due to its location at the mouth of a protected bay where Steller's eiders winter. The magnitude of collision risk is likely to be higher than Alternative 1a due to the more restricted mouth of Iniskin Bay (which may funnel Steller's eiders towards the lightering location), and higher wintering density of eiders directly adjacent to the lightering location. If bulk carriers are moored at the lightering location in Iniskin Bay during periods of dense fog or low visibility and the bulk carrier's lights are illuminated, the potential for eider collision would be increased. If bulk carriers are moved to the alternate lightering location on the western side of Augustine Island, the risk of eider collision is likely lower because fewer birds have been documented wintering directly west of Augustine Island. This would reduce the risk of collisions with the bulk carriers for eiders in Iniskin Bay during stormy weather conditions. Overall, impacts to Steller's eiders from Alternative 2 are anticipated to be similar to Alternative 1a, but more eiders could be impacted because several hundred eiders are known to winter throughout Iliamna and Iniskin bays.

The magnitude and extent of impacts due to construction of a port at Diamond Point would be the loss of nearshore marine benthic foraging habitat for Steller's eiders. One port design at Diamond Point would be an earthen causeway with a sheet pile jetty structure. The acreages of habitat both permanently and temporarily removed by Alternative 2 are detailed in Table 4.25-5. Due to the need for dredging, a larger acreage of benthic habitat would be periodically disturbed for the life of the project compared to Alternative 1a, where no dredging would be necessary. Under the Pile-Supported Dock Variant, less marine habitat would be impacted, although dredging would still be necessary.

In summary, the magnitude of impacts from the project on Steller's eiders would be disturbance and changes to forging areas (including habitat loss) and the potential for injury and mortality from collisions with project vessels and the port infrastructure. The duration would last for life of the project, and extent would be limited to the footprint of the port (including the dredged area) and the lightering locations.

4.25.6.8 Short-Tailed Albatross

There would be no additional potential impacts to short-tailed albatross beyond those previously detailed above for Alternative 1a because the proposed vessel routes outside of Cook Inlet are the same for all alternatives.

4.25.7 Alternative 3—North Road Only

Although the port is shifted slightly north into Iliamna Bay and there is only one lightering location in Iniskin Bay, there are no new geographical areas potentially impacted by this alternative in the marine environment of Cook Inlet; therefore, no new information for any TES is presented. All information for this alternative is previously covered by Alternative 1a (for impacts to species from vessel noise and presence, and impacts from injury and mortality) and Alternative 2 (impacts from dredging and port construction). Compared with Alternative 2, Alternative 3 would have a caisson dock similar to Alternative 1a, and a dredged navigation channel and turning basin similar to Alternative 2. Temporary and permanent impacts associated with construction and operations are detailed above in Table 4.25-6. One important difference with Alternative 3 and the other alternatives is a reduction in the number of annual project-related vessel movements in Cook Inlet. Fewer lightering vessel trips are required to load the bulk carriers under Alternative 3 (6 trips versus 10 trips for all other alternatives); therefore, there is a reduced potential for disturbance, injury, and mortality from vessel collisions with lightering vessels. Underwater noise impacts to TES are discussed previously under Alternative 1a for the caisson dock. Maintenance dredging would be required (potentially every 5 years for the life of the project), and impacts from maintenance dredging are previously discussed under Alternative 2. There is one variant for Alternative 3 that would have a minor impact on TES. The Concentrate Pipeline Variant could potentially result in slurry water being discharged into Cook Inlet. However, as detailed in Section 4.18, Water and Sediment Quality, all water that would be discharged into Cook Inlet would meet or exceed water quality standards, and therefore no impacts to the marine environment are anticipated. In addition, under the Concentrate Pipeline Variant, construction of the concentrate pipeline and the optional return water pipeline would increase the average width of the road corridor by approximately 3 feet (PLP 2018-RFI 066), in comparison to the base case Alternative 3. This would slightly increase the width of the port access road around Diamond Point, encroaching slightly into Iliamna Bay, where critical habitat exists for Cook Inlet beluga whale and northern sea otter. All other impacts are anticipated to be the same as Alternative 2 and are not reiterated here.

The draft biological assessments for species under the purview of the USFWS and NMFS (Appendix G and Appendix H, respectively) contain the most detailed information for Alternative 3; the key impacts are briefly discussed below.

Table 4.25-6: Summary of Construction and Operations Impacts for Alternative 3

Project Component	Acres of Impacts
Construction	
Caisson Dock and other Marine Components	There would be 6 acres of permanent habitat loss from overwater structures such as the access causeway, marine jetty, and bulk loader in Iliamna Bay for the Concentrate Pipeline Variant. This would represent a permanent loss of critical habitat for Cook Inlet beluga whale and northern sea otter. There would be additional temporary impacts to adjacent habitat from a 30-foot construction buffer.
Port Access Road	Blasting of rock and fill would be placed into the intertidal zone along the shore of Iliamna Bay to create the port facilities and access road to the caisson dock. This would result in 19.1 acres of permanent habitat loss designated as critical habitat for Cook Inlet beluga whale and northern sea otter. There would be additional temporary impacts to adjacent habitat from a 30-foot construction buffer.
Navigation Channel and Turning Basin	The construction of the navigation channel and turning basin at the port would result in 75.5 acres of temporary habitat loss for Cook Inlet beluga whale, and permanent habitat loss for northern sea otter. There would be an additional temporary impacts to adjacent habitat from a 30-foot construction buffer.
Lightering Location	The total spread of the anchors per lightering location is approximately 2,300 feet by 1,700 feet. The total substrate covered by the anchors is 0.07 acre from the combined footprints of all anchors necessary to hold the mooring buoys in place. This would be a permanent loss of critical habitat for Cook Inlet beluga whale and northern sea otter.
Lighted Navigation Buoys	None are required.
Natural Gas Pipeline (and adjacent fiber-optic cable)	The maximum corridor width from anchors placed for the pipe-lay barge may extend out to 8,202 feet in diameter. The pipeline would be trenched into the substrate and result in temporary impacts to approximately 118.7 acres of designated Cook Inlet beluga whale critical habitat, 164.8 acres of designated northern sea otter critical habitat, and 496 acres of proposed humpback whale critical habitat. The primary noise source during pipeline and fiber optic cable placement emanates from tugboats during dynamic positioning. It was determined that a 1.7-mile radius was a conservative distance for the extent of underwater noise generated by the tugboats during anchor handling activities, which exceeds the 120-dB harassment threshold for continuous noise sources. This 1.7-mile radius would encompass all potential noise sources, including those from various dredging technologies and from anchor handling. The average width of impacts (both physical and from underwater noise) would extend approximately 4.4 miles in width along the length of the pipeline though Cook Inlet.
Aircraft Activity	No airstrip is planned at the Diamond Point port; therefore, no noise impacts are anticipated from project aircraft in the area. There is an existing airstrip farther inland at Pedro Bay that would be used, and no impacts to TES are anticipated from use of the airstrip.
Operations	
Vessel Activity	Twenty-seven concentrate vessel shipments would depart the lightering locations annually. Each concentrate vessel would require up to 6 lightering trips to fill each concentrate vessel (162 lightering trips annually). An additional 33 supply barges (inclusive of four fuel barges) would be required annually to supply consumables, fuel, and reagent. This equates to 222 annual project-related vessel trips in the analysis area. There would also be oceanic tugboats to pull the supply barges and port-based tugboats to assist the bulk carrier with mooring, and to move the lightering barges. Vessel routes (shipping lanes) would extend north to Nikiski and south through the Gulf of Alaska to West Coast ports, and west along the southern side of the Aleutian Islands through Unimak Pass, into the Bering Sea, and out to the exclusive economic zone. The width of the vessel routes would be approximately 7.4 miles, and encompass the zone of ensonification from project-related vessels.

Table 4.25-6: Summary of Construction and Operations Impacts for Alternative 3

Project Component	Acres of Impacts
Port Maintenance Dredging	There would periodic maintenance dredging at the port. Although the frequency of required maintenance dredging is unknown, it could occur every 5 years for the life of the project. Approximately 75.5 acres of Cook Inlet beluga whale and northern sea otter habitat would be periodically dredged. This would be considered a temporary impact to Cook Inlet beluga whale critical habitat, because they do not normally feed on benthic species, but it would be a permanent impact to northern sea otters. It would also be a permanent impact to Steller's eider foraging habitat. Maintenance dredging would generally occur during the summer months and last 3 to 4 weeks.
Aircraft Activity	No airstrip is planned at the Diamond Point port, and the existing airstrip at Pedro Bay would be used infrequently.

4.25.7.1 Cook Inlet Beluga Whale

Although most impacts to Cook inlet beluga whales are similar to Alternative 2, there would be slightly more impact to critical habitat from the natural gas pipeline corridor, port facilities (including the road), and navigation channel. The acreages of impacts are detailed above in Table 4.25-6, and although most of the habitat disturbed would be considered a temporary impact, the fill of material into Iliamna Bay from the port access road and caissons would be permanent. The amount of habitat that would be impacted would represent a small fraction of the overall habitat available for Cook Inlet beluga whales, and the species is uncommon, and has rarely been detected in recent years in Iliamna and Iniskin bays. In addition, there is a proposed vessel route to Nikiski that may be used to transport fuel via four barges annually to the port. Vessels would be traveling slowly (less than 10 knots), and are unlikely to cause injury and mortality to Cook Inlet beluga whales that may be wintering off the mouth of the Kenai River. Measures detailed in Table 5-2, and the NMFS draft biological assessment would reduce potential impacts to Cook Inlet beluga whales. Therefore, there is a low magnitude of impacts from habitat loss and potential for strike; the extent would encompass both Iliamna and Iniskin bays and shipping lanes in Cook Inlet; and the duration would be for the life of the project.

4.25.7.2 Humpback and Fin Whale

Similar to impacts detailed previously under Alternative 2, both humpback and fin whales have not been detected in Iliamna or Iniskin bays, and therefore are unlikely to be impacted by noise or habitat loss from construction of the port. Both species prefer deeper waters for feeding, and both bays are relatively shallow, with restricted entrances. Both species may be temporarily disturbed from summer feeding areas while the natural gas pipeline and fiber-optic cable is trenched through Cook Inlet; however, neither species feed on benthic fauna, and temporary noise and turbidity would only impact a few individuals if present in the vicinity during construction activities. Both species are more common south of Cook Inlet, where vessels would not be restricted to a 10-knot speed limit. Details of potential for injury and mortality were previously discussed under Alternative 1a, because the vessel routes would be the same. Measures detailed in Table 5-2 and the NMFS draft biological assessment would reduce potential impacts to humpback and fin whales. Therefore, there is a low magnitude of impacts from noise, disturbance, and potential for vessel strike in the analysis area. Some of the impacts would occur only during construction, with a low potential for vessel collision lasting for the life of the project.

4.25.7.3 Blue, Sperm, Sei, Gray, and North Pacific Right Whale

Five endangered whale species have a potential to occur in the project shipping routes in the Pacific Ocean, including the Gulf of Alaska, along the Aleutian Islands, and the Bering Sea. The same impacts from vessels (noise, physical disturbance, and potential for injury and mortality) previously detailed above for Alternative 1a have a potential to occur for blue, sperm, sei, gray, and North Pacific right whales. Because these whale species do not occur around the Diamond Point port, there are no additional impacts to these species that are specific to Alternative 3, and all impacts are previously discussed under Alternative 1a.

4.25.7.4 Steller Sea Lion

As previously detailed under Alternative 2, Steller sea lions occur in Iliamna and Iniskin bays, but there are no major haulouts or rookeries in the vicinity of the port or lightering locations. There would be a loss of habitat from construction of the port, and noise impacts would occur during construction. Steller sea lions are less common in Iliamna and Iniskin bays during summer; therefore, impacts from construction of the natural gas pipeline and fiber-optic cable installation would be less. Project vessels would transit well-established vessel routes that bypass major haulouts and rookeries by at least 5 nautical miles. Measures detailed in Table 5-2 and the NMFS draft biological assessment would reduce potential impacts to Steller sea lion. There is a low magnitude of impacts from noise during project construction and operations, along with a low potential for injury and mortality, because Steller sea lions are highly mobile and maneuverable. There would be disturbance to a small portion of available foraging habitat in Iliamna and Iniskin bays. The extent of impacts would be focused on Iliamna and Iniskin bays and the vessel routes that pass through critical habitat buffers around haulouts and rookeries. The duration of impacts would be for the life of the project, but primarily during operations, when concentrate bulk carriers are traveling through the proposed vessel routes.

4.25.7.5 Northern Sea Otter

Similar to Alternative 2, there are high densities of northern sea otters in Iliamna and Iniskin bays. There would be a permanent loss of habitat from the dock and navigation channel. Vessels would travel slowly when entering critical habitat for northern sea otters, but there would be a large increase in vessel traffic above current levels. There is a potential for above-water noise impacts during blasting to create the port access road. This would be conducted at low tide when sea otters are furthest away. All potential sources of noise that could impact northern sea otters would be monitored by PSOs. There is a potential for loss of 100.6 acres of permanent habitat that is designated as critical habitat. Measures detailed in Table 5-2 and the USFWS draft biological assessment would reduce potential impacts to northern sea otter. Overall, the magnitude of impacts would be moderate because the loss of habitat is a small percentage of the overall critical habitat, but there is a high density of sea otters in the area. The duration would last for the life of the project, and the extent would be limited to the analysis area, particularly Iliamna and Iniskin bays.

4.25.7.6 Steller's Eider

The only lightering location would be on the western side of Iniskin Bay in deep waters where Steller's eiders are less likely to forage. Based on the specific locations of wintering Steller's eiders (detailed in Section 3.25, Threatened and Endangered Species), they appear to prefer the shallower waters on the eastern side and northern end of Iniskin Bay. They would have to fly past the lightering location to access the bay, and therefore have a potential to collide with vessels moored at the lightering locations. As detailed previously, the risk would be elevated during periods of inclement weather such as low clouds and fog.

Construction of the dock and navigation channel would result in permanent loss of habitat used by Steller's eiders for foraging primarily during winter. Because the navigation channel would be periodically dredged to remove silt in material, any benthic organisms that had accumulated would also be removed. This process would cause repeated disturbance to the navigation channel, which is considered preferred foraging habitat for Steller's eider. Measures detailed in Table 5-2, Mitigation, and the USFWS draft biological assessment would reduce potential impacts to Steller's eiders. The magnitude of impacts would be loss of foraging habitat and a potential for collisions in an area with several hundred Steller's eiders during winter. However, only a small percentage of the Steller's eiders that winter in Cook Inlet are from the federally listed Alaska breeding population. The duration would last for the life of the project, and the extent would primarily be restricted to Iliamna and Iniskin bays.

4.25.7.7 Short-Tailed Albatross

There would be no additional potential impacts to short-tailed albatross beyond those previously detailed above for Alternative 1a, because the proposed vessel routes outside of Cook Inlet are the same for all alternatives.

4.25.8 Cumulative Effects

Impacts to TES would be those related to impacts considered a "take" (defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct"), which is prohibited except as incidentally authorized through consultation with USFWS and NMFS. The cumulative effects analysis area for TES includes the project footprint for all alternatives and variants, the expanded mine footprint (including road, pipeline, and port facilities), and all other reasonably foreseeable future actions (RFFAs) in the vicinity of the project that would result in potential synergistic and interactive effects. This includes the extended geographic area where direct and indirect effects to TES may occur throughout the life of the project. Past, present, and RFFAs in the cumulative impact analysis area have the potential to contribute cumulatively to impacts on TES.

Several of the RFFAs detailed in Section 4.1, Introduction to Environmental Consequences, are considered to have no potential for cumulatively impacting TES in the analysis area. These would include activities associated with exploration, development, and operation of natural resources; regional and community road, air, and marine transportation; and non-industrialized point-source activities that are unlikely to result in any appreciable impact on TES beyond a temporary basis (such as tourism, recreation, fishing, and regulated hunting). Other RFFAs removed from further consideration include those that are solely terrestrial-based (have no marine component in Cook Inlet) and outside the analysis area (e.g., Groundhog, community infrastructure projects).

4.25.8.1 Past and Present Actions

Past and present activities, such as subsistence hunting and fishing, commercial fishing, commercial shipping, research activities, and oil and gas exploration and development, have affected TES through direct injury/mortality, habitat loss and degradation (including noise impacts), and behavioral disturbance. The past and present human activities affecting Cook Inlet beluga whales include subsistence harvest, past commercial whaling, poaching or intentional harassment, and incidental mortality or injury from fisheries, vessel, and research activities (NMFS 2016b).

Past and present factors affecting humpback whales include subsistence hunting, incidental entrapment or entanglement in fishing gear, collision with ships, and disturbance or displacement caused by noise and other factors associated with shipping, recreational boating, high-speed thrill

craft, whale watching, and air traffic. Introduction and/or persistence of pollutants and pathogens from waste disposal; disturbance and/or pollution from oil, gas or other mineral exploration and production; habitat degradation or loss associated with coastal development; and competition with fisheries for prey species may also impact the whales (NMFS 1991).

Populations of fin whales in the North Atlantic, North Pacific, and Southern Hemisphere have been legally protected from commercial whaling for the last 20 or more years, and this protection continues. Although the main direct threat to fin whales was addressed by the International Whaling Commission moratorium on commercial whaling, several potential threats remain. Among the current potential threats are collisions with vessels, reduced prey abundance due to overfishing and/or climate change, the possibility that illegal whaling or resumed legal whaling would cause removals at biologically unsustainable rates, and possibly, the effects of increasing anthropogenic ocean noise (NMFS 2010b).

Factors affecting Steller sea lions include killer whale (*Orcinus orca*) and shark predation, commercial harvest (prior to 1973), subsistence harvest, incidental take by fisheries, illegal shooting, entanglement in marine debris, disease and parasitism, toxic substances, disturbance, reduced prey, and climate change (NMFS 2008c).

Multiple human actions have had negative effects on the southwest Alaska stock of northern sea otters. These include mortality due to marine oil spills, take by Alaska Natives for subsistence and handicrafts, illegal intentional take, incidental take in fisheries, exposure to environmental contaminants, habitat degradation and loss, heightened risk of disease, and disturbance (USDOI, MMS 2003). The cause of the overall decline is not known with certainty, but the weight of evidence points to increased predation, with the killer whale as the most likely cause. The threats judged to be most important are predation (moderate to high importance) and oil spills (low to moderate importance) (USFWS 2013c).

When the Alaska-breeding population of the Steller's eider was listed as threatened, the factor(s) causing the decline were unknown. Factors identified as potential causes of decline in the final rule listing the population as threatened included predation, hunting, ingestion of spent lead shot in wetlands, and changes in the marine environment that could affect Steller's eider food or other resources. Since listing, other potential threats, such as exposure to oil or other contaminants near fish processing facilities in southwest Alaska have been identified, but the causes of decline and obstacles to recovery remain poorly understood (USFWS 2002). Additional confounding variables with climate change may also affect the species' ability to recover.

4.25.8.2 Reasonably Foreseeable Future Actions

The following RFFAs identified in Section 4.1, Introduction to Environmental Consequences, were carried forward in this analysis based on their potential to impact TES in the analysis area: Pebble Project expansion scenario; Cook Inlet Oil and Gas Development; Alaska Liquefied Natural Gas Project; Alaska Stand Alone Pipeline Project; and the continued development of the Diamond Point Rock Quarry.

All of these RFFAs would cause an increase in vessel traffic in Cook Inlet, which would increase the likelihood of TES being affected by behavioral disturbance and/or vessel strikes (potentially resulting in injury or mortality). For each additional project, a larger area would be potentially affected, increasing both the extent and duration of cumulative impacts.

The RFFA that would contribute the most to the cumulative impacts on TES in the analysis area is the Pebble Project expansion scenario, because it would directly affect the same species in the same location as the project and would continue those impacts for a long period of time.

The No Action Alternative would not contribute to cumulative effects on TES. The project alternatives with the RFFAs' contribution to cumulative effects on TES are summarized in Table 4.25-7. Only marine components in Cook Inlet from RFFAs (or RFFAs that have a component that could impact Cook Inlet) are discussed below, because no TES occur in the terrestrial environment in lower Cook Inlet.

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Pebble Project Expansion Scenario	**Port:** The Pebble Project expansion scenario that may affect TES would be the new deepwater loading facility at Iniskin Bay for concentrate shipment. In mine year 20, a new deepwater loading facility at Iniskin Bay would be constructed and would operate concurrently with the Amakdedori port (under Alternative 1a) for 78 years or longer. A water treatment facility associated with the concentrate pipeline would also be built at Iniskin Bay, but any discharge would be required to meet state water quality standards. **Magnitude:** The Pebble Project expansion scenario footprint would result in increased vessel traffic and noise throughout Kamishak Bay (but focused in Iniskin Bay), which would increase potential for behavioral disturbance and injury and mortality to TES. There would also be loss of critical habitat for Cook Inlet beluga whale and northern sea otter in Iniskin Bay through port facility construction. **Duration/Extent**: All vessel traffic in Cook Inlet associated with the project would continue for a total of 98 years, extending the duration of underwater and airborne noise, behavioral disturbance, and risk of injury or mortality from vessel collisions or spills. This would increase both the duration and extent of potential effects on all TES in the analysis area— Cook Inlet beluga whale, humpback whale, fin whale, Steller sea lion, northern sea otter, and Steller's eider—which are discussed in the following sections. The geographic extent would include both port sites (Amakdedori	**Port**: Same impact to TES compared with Alternative 1a. **Magnitude**: Same as Alternative 1a. **Duration/Extent**: Same as Alternative 1a. **Contribution**: Same as Alternative 1a.	**Port**: Because the Diamond Point port and lightering location in Iniskin Bay are adjacent to the port under the Pebble Project expansion Scenario, the cumulative noise, disturbance, and collision risk from increased vessel traffic is expected to have a greater impact on TES than having the ports farther apart at Amakdedori and Iniskin bay under Alternative 1a. Furthermore, a natural gas compressor station constructed at Diamond Point would increase ambient noise in Iliamna Bay, thereby increasing noise impacts to nearby TES. The close proximity of the two ports would compound the effects, because there would be less nearby habitat for TES to move to when disturbed by project noise and vessel traffic. **Magnitude**: There would be increased noise and vessel disturbance focused around Iliamna and Iniskin bays. This may cause some TES to avoid using heavily trafficked areas. Avoidance of areas would be cumulative in addition to critical habitat loss for Cook Inlet beluga whale and northern sea otter. There is a potential for increased vessel collisions potentially resulting in injury and mortality from concentrated project activities in these two secluded bays. **Duration/Extent**: Same duration as Alternative 1a, but the extent would be focused on Iliamna and Iniskin bays.	**Port:** Same impact to TES compared with Alternative 2. Because the only lightering location under Alternative 3 is in Iniskin Bay, impacts to all TES in that bay would be high due to elevated levels of project activities concentrated in Iniskin Bay. **Magnitude**: Same impact to TES compared with Alternative 2. **Duration/Extent**: Similar impact to TES compared with Alternative 2, with the extent primarily in Iniskin Bay. **Contribution**: Same impact to TES compared with Alternative 2.

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	and Iniskin bay), and marine traffic in Cook Inlet serving both ports. **Contribution:** The Pebble Project expansion scenario would increase the amount of year-round ship traffic in Cook Inlet; specifically in the areas around the Amakdedori and Iniskin bay, where there are currently low levels of vessel traffic.		**Contribution**: Same as Alternative 1a, with impacts focused on Iliamna and Iniskin bays.	
	Magnitude: Potential future cumulative impacts to Cook Inlet beluga whale, humpback, fin, blue, sei, sperm, gray, and North Pacific right whale, Steller sea lion, northern sea otter, Steller's eider, and short-tailed albatross from the project (regardless of alternative or variant selected) in conjunction with the Pebble Project expansion scenario would be from increased vessel traffic, behavioral disturbance, habitat loss and modification (including critical habitat for some species), and injury and mortality with the addition of the port facilities at Iniskin Bay. *Cook Inlet Beluga Whale* Iniskin Bay contains critical habitat for Cook Inlet beluga whale and construction and operations of the port would result in similar impacts to Cook Inlet beluga whales that have been analyzed herein for Amakdedori port. The acreage of critical habitat loss from construction of a port in Iniskin Bay is currently unknown. Construction of the port would cause underwater noise, which is listed as a primary potential stressor for beluga whales in the Cook Inlet Beluga Whale Recovery Plan (NMFS 2016b). Beluga whales are rare in the analysis area (which includes the port at Iniskin Bay) during the summer, so they would be unlikely during summer construction. Beluga whales that may occasionally occur in the analysis area during the winter could be affected by the increased vessel traffic through behavioral disturbance or vessel strike. *Humpback Whale* Increased vessel traffic may impact humpback whales from disturbance and potential vessel strikes. Humpback whales have not been detected in Iniskin Bay, and therefore are unlikely to be impacted by construction in Iniskin Bay. They are more likely to be encountered in deeper waters of Cook Inlet while vessels are transiting to the port at Iniskin Bay. Humpback whales occur in Cook Inlet during the summer feeding months, and therefore are most likely to be encountered during summer operations. There is potential for injury or mortality through vessel strikes. No critical habitat is proposed in Iniskin Bay for humpback whales (Mexico DPS); however, proposed critical habitat would be transited through by project vessels in Kamishak Bay and lower Cook Inlet. *Fin Whale* Impacts to fin whales would be similar to those described for humpback whales, except fin whales are rare in Cook Inlet, especially in shallow waters around Iniskin Bay. They have not been documented around Iniskin Bay and have primarily been detected near the mouth of Cook Inlet. They are unlikely to be impacted by construction noise and have a potential to experience behavioral disturbance and injury and mortality from project vessels during operations.			

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	Blue, Sperm, Sei, Gray, and North Pacific Right Whales Impacts would be similar to those described for humpback and fin whales, which also occur in the Gulf of Alaska and along the Aleutian Islands out to the exclusive economic zone. They are unlikely to be impacted by construction noise in Cook Inlet (because these whale species do not normally occur in Cook Inlet), but have a potential for behavioral disturbance and injury and mortality from project vessels during operations, especially from concentrate bulk carriers traveling in Shelikof Strait, or along self-edge habitats in the Gulf of Alaska, along the Aleutian Islands, and in the Bering Sea. *Steller Sea Lion* Impacts to Steller sea lion would be similar to other TES, with primary impacts related to construction noise and operational vessel traffic. However, Steller sea lions have been detected multiple times in Iniskin Bay. In particular, Steller sea lions may be drawn to spawning herring near the mouth of Iniskin Bay and may be disturbed by the construction and operations of the port in Iniskin Bay. Increased vessel traffic increases the risk of adverse interactions such as behavioral disturbance or vessel strikes. There is also the potential for increased injury and mortality from vessel strikes in the analysis area, although this potential is low, due to the species' ability to detect vessels and maneuver out of the way. *Northern Sea Otter* Northern sea otters may experience similar impacts to other TES, but they have high densities in and around Iniskin Bay and the surrounding waters. There is critical habitat in Iniskin Bay that would be affected by the construction and operations of the port in Iniskin Bay. The acreage of critical habitat loss from construction of a port in Iniskin Bay is currently unknown. Increased vessel traffic would increase the risk of adverse interactions such as behavioral disturbance and vessel strikes. *Steller's Eider* Wintering Steller's eiders have been observed in Iniskin Bay, and therefore may experience injury or mortality, habitat loss, and disturbance from construction and operations of a port in the protected bay. Increased vessel traffic would increase the potential for eiders to collide with ships during the winter (late November through early April), especially during inclement weather conditions. Iniskin Bay provides wintering habitat that is relatively protected, and construction and operations of a port in the bay may cause the species to avoid using the area. *Short-tailed Albatross* Short-tailed albatross have not been reported in Cook Inlet, and the only potential impacts to the species would be a low potential for increased disturbance while resting and foraging in pelagic and self-edge waters in the Gulf of Alaska and along the Aleutian Islands from increased vessel traffic in shipping lanes. There is also a low potential for injury and mortality from vessel collisions. **Duration/Extent**: The duration of construction-related noise impacts to all TES would be temporary only occurring during construction. However, impacts from vessel traffic would last for the life of the project, up to the 78-year extended mining/milling period. The extent of the impacts would be localized in the immediately vicinity of the port facilities in Iniskin Bay and throughout Kamishak Bay, depending on shipping routes. **Contribution:** The likelihood of cumulative impacts is low for Cook Inlet beluga whales because they do not commonly occur in the analysis area, especially around Iniskin Bay. The likelihood of cumulative impacts is moderate for humpback, fin, blue, sei, sperm, gray, and North Pacific right whales, because they may suffer disturbance and injury or mortality from vessel operations. The likelihood of cumulative impacts is moderate for Steller sea lion and northern sea otter because they occur regularly in the analysis area. The likelihood of cumulative impacts is moderate for Steller's eiders, because they winter in the vicinity of Iniskin Bay.			

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Alaska Stand Alone Pipeline Project	**Magnitude:** Impacts to TES from this project would be increased vessel traffic (quantity unknown) in Cook Inlet and potential impacts to Cook Inlet beluga whale critical habitat. **Duration/Extent:** The duration would last for the life of the project and extent would be limited mainly to the port facilities at Point MacKenzie. Vessel traffic would likely follow existing shipping lanes in the center of Cook Inlet. Only Cook Inlet beluga whale is known to regularly occur around the port facilities at Point MacKenzie. There is a potential for vessel strikes to all TES from boats transporting supplies and LNG, but this would be limited mainly to the lower portion of Cook Inlet. **Contribution:** Vessel traffic would contribute cumulatively to behavioral avoidance, underwater noise impacts, and potential for injury and mortality, mainly to Cook Inlet beluga whales, but also to any other TES that occur in shipping lanes in Cook Inlet.			
Alaska LNG	**Magnitude:** Impacts to TES from this project would be increased vessel traffic during operations (204 to 360 port calls at Nikiski per year, potentially resulting in a 42 to 74 percent increase in large ship traffic in Cook Inlet [FERC 2019b]) in Cook Inlet and potential impacts to Cook Inlet beluga whale critical habitat. **Duration/Extent:** The duration would last for the life of the project, and extent would be limited mainly to the port facilities at Nikiski. Vessel traffic would likely follow existing shipping lanes in the center of Cook Inlet. Only Cook Inlet beluga whale is known to regularly occur around the port facilities at Nikiski. There is a potential for vessel strikes to all TES from boats transporting supplies and LNG, but this would be limited mainly to the lower portion of Cook Inlet. **Contribution:** Vessel traffic would contribute cumulatively to behavioral avoidance, underwater noise impacts, and potential for injury and mortality, mainly to Cook Inlet beluga whales, but also to any other TES that occur in shipping lanes in Cook Inlet.			
Cook Inlet Oil and Gas Lease Sales	**Magnitude**: Operations of existing offshore oil and gas production platforms in Cook Inlet have a potential to impact TES through noise, vessel and aircraft traffic, habitat impacts, and injury or mortality. **Duration/Extent**: Potential impacts are restricted to the existing offshore oil and gas platforms, and impacts are likely to occur through the operational life of each platform. Additional exploration activities have a potential to impact TES, depending on the timing, location, and type of activity. **Contribution**: Continued use of existing platforms and exploration activities has a potential to increase cumulative impacts on TES (especially Cook Inlet beluga whales), but not in the analysis area, because most activities occur farther north in Cook Inlet.			
Diamond Point Rock Quarry	**Magnitude**: The Diamond Point Rock Quarry at Cottonwood and Iliamna bays would impact critical habitat for Cook Inlet beluga whale and northern sea otter. This would include permanent loss of critical habitat, with additional impacts from underwater noise due to blasting, placement of fill in the marine environment, and manipulation of the substrate. Wintering Steller's eiders may also experience increased disturbance in	Similar to Alternative 1a.	**Magnitude:** The footprint of the Diamond Point Rock Quarry coincides with the Diamond Point port footprint under this alternative. Impacts include a loss of Cook Inlet beluga whale and northern sea otter critical habitat that would be additive to those of Alternative 2. Additional TES may be impacted through underwater noise, behavioral disturbance, and foraging	Similar to Alternative 2, except the port does not overlap with the Diamond Point Rock Quarry, because the port would be shifted north into Iliamna Bay.

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	wintering and foraging areas. Steller sea lions may be impacted by underwater noise, loss of foraging habitat, and vessel traffic. Depending on where quarried material is taken, there may be vessel traffic disturbance and potential for injury and mortality for TES in lower Cook Inlet. **Duration/Extent**: The duration of impacts would last for the life of the project, and the geographic extent would be limited to Cottonwood and Iliamna bays, along with shipping routes for quarried material. **Contribution:** The project would contribute to cumulative loss of habitat (including critical habitat) for several TES, as well as disturbance and potential for injury or mortality.		habitat loss, including Steller sea lion and Steller's eiders. **Duration/Extent**: The duration of impacts would last for the life of the project, and the geographic extent would be limited to Cottonwood and Iliamna bays, along with shipping routes for quarried material. **Contribution:** The project would contribute to cumulative loss of habitat (including critical habitat) for several TES, as well as disturbance and potential for injury or mortality.	
Summary of Project contribution to Cumulative Effects	Alternative 1a would contribute cumulatively to impacts to TES in Cook Inlet, when taking other past, present, and RFFAs into account. This would include an increase in vessel traffic in Kamishak Bay, an area with relatively little existing commercial vessel traffic. There would also be an increase in traffic in the Gulf of Alaska, along the Aleutian Islands, and in the Bering Sea from project vessels. There would be an increase in the potential to impact a variety of TES, with northern sea otters most likely to be impacted due to their high density in Kamishak Bay. There would be relatively little loss of critical habitat, because most projects have small in-water footprints and there is a vast amount of nearby critical habitat. There would be an increase in vessel noise, presence, disturbance, and potential for	Similar to Alternative 1a.	Alternative 2 would contribute cumulatively to impacts to TES in Cook Inlet, when taking other past, present, and RFFAs into account. This would include impacts in Iliamna and Iniskin bay, an area with relatively little existing commercial vessel traffic, but slightly more than Amakdedori due to the presence of summer traffic to Williamsport. There would be an increase in the potential to impact a variety of TES, with northern sea otters most likely to be impacted due to their high density in the area. Molting and wintering Steller's eiders may also be impacted, because several hundred use Iliamna and Iniskin bays for several months out of the year. There would be relatively little loss of critical habitat, because	Similar to Alternative 2, but with an increase in impacts concentrated in Iniskin Bay.

Table 4.25-7: Contribution to Cumulative Effects on TES

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	injury and mortality to several whale species that occur in the Gulf of Alaska, along the Aleutian Islands, and in the Bering Sea.		most projects have small in-water footprints and there is a vast amount of nearby critical habitat. There would be an increase in vessel noise, presence, disturbance, and potential for injury and mortality to several whale species that occur in the Gulf of Alaska, along the Aleutian Islands, and in the Bering Sea.	

Notes:

DPS = Distinct Population Segment
LNG = Liquefied Natural Gas
RFFAs = reasonably foreseeable future actions
TES = Threatened and Endangered Species