# ENVIRONMENTAL ASSESSMENT FOR THE ISSUANCE OF REGULATIONS AND LETTERS OF AUTHORIZATION FOR THE TAKE OF MARINE MAMMALS INCIDENTAL TO HILCORP ALASKA LLC OIL AND GAS ACTIVITIES IN COOK INLET, ALASKA

**LEAD AGENCY:**

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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**LOCATION:**

Cook Inlet, Alaska

**ABSTRACT:**

National Marine Fisheries Service proposes to issue regulations and letters of authorization to Hilcorp Alaska LLC for the take of marine mammals incidental to oil and gas activities in Cook Inlet, Alaska.

**DATE:**

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# Chapter 1 Introduction and Purpose and Need

## 1.0 Introduction and Background

The National Marine Fisheries Service (NMFS) has statutory responsibility to authorize incidental take of marine mammals pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.) after receipt and review of an application if certain findings and determinations are made. In general, NMFS must issue incidental take authorizations (ITA) for small numbers of marine mammals to an applicant if the proposed take is: incidental to an otherwise lawful activity, limited to harassment, occurs within a specific geographic area, will have a negligible impact on affected marine mammal species, and is subject to appropriate mitigation and monitoring. NMFS received an application from Hilcorp Alaska LLC (Hilcorp), requesting regulations for incidental take of marine mammals from oil and gas activities associated with exploration and development. In addition, the National Environmental Policy Act (NEPA), 40 Code of Federal Regulations (CFR) Parts 1500 -1508, and the National Oceanic and Atmospheric Administration (NOAA) policy and procedures[1] require all proposals for major federal actions be reviewed with respect to environmental consequences on the human environment. Therefore, NMFS conducted an environmental review of Hilcorp's application and determined an Environmental Assessment (EA) is appropriate for NMFS consideration to issue regulations and Letters of Authorization (LOAs) to Hilcorp.

This Chapter presents a summary of NMFS authority to authorize incidental take of marine mammals, a summary of the applicant's request, and identifies NMFS proposed action and purpose and need. This Chapter also explains the background and environmental review process associated with the applicant's request and provides other information relevant to the analysis in this EA, such as the scope of the analysis and compliance with environmental laws and regulations. The remainder of this EA is organized as follows:

- Chapter 2 describes the applicant's activities and the alternatives carried forward for analysis as well as alternatives not carried forward for analysis.
- Chapter 3 describes the baseline conditions of the affected environment.
- Chapter 4 describes the direct, indirect and cumulative impacts to the affected environment, specifically impacts to marine mammals and their habitat associated with NMFS' proposed action and alternatives.
- Chapter 5 lists document preparers and Chapter 6 lists references cited.

## 1.1 Marine Mammal Protection Act Overview

When the MMPA was enacted in 1972, Congress made several findings concerning the conservation of marine mammals, including, but not limited to, indicating that "certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities" (16 U.S.C. 1361(1)) [and] "such species and population stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part[…]" (16 U.S.C. 1361(2)) [and that] "marine mammals…[are] resources of great international significance… [that] should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem[….]" (16 U.S.C.

[1] National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6A "Compliance with the National Environmental Policy Act and Executive Order 12114 Environmental Effects Abroad of Major Federal Actions 11988 and 13690 Floodplain Management; and 11990 Protection of Wetlands" and the Companion Manual for NAO 216-6A.

1361(6)). These and other findings in Section 2 of the MMPA speak to the need to maintain a broad scope in marine mammal protection that considers species- and ecosystem-level impacts.

To serve these broader goals, Section 101(a) of the MMPA prohibits the incidental taking of marine mammals. The incidental take2 of a marine mammal falls under three categories: mortality, serious injury, or harassment (i.e., injury and/or disruption of behavioral patterns). Harassment3 is any act of pursuit, torment, or annoyance that 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). Disruption of behavioral patterns includes, but is not limited to, migration, breathing, nursing, breeding, feeding or sheltering. However, Sections 101(a)(5)(A) and (D) of the MMPA provide exceptions to the prohibition on take, which give NMFS the authority to authorize the incidental but not intentional take of small numbers of marine mammals, provided certain determinations are made and statutory and regulatory procedures are met. ITAs may be issued as either (1) regulations and associated Letters of Authorization (LOA) or (2) IHAs, when a proposed action will not result in a potential for serious injury and/or mortality or where any such potential can be negated through required mitigation measures. IHAs may be issued for a maximum period of one year.

NMFS also promulgated regulations to implement the provisions of the MMPA governing the taking and importing of marine mammals (50 Code of Federal Regulations (CFR) Part 216) and produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA.

### 1.2 Summary of Hilcorp Incidental Take Authorization Request

Hilcorp's proposed exploration, development, production, and decommissioning activities include conducting two-dimensional (2D) and three dimensional (3D) seismic surveys, geohazard surveys, vibratory sheet pile driving, and drilling of exploratory wells. The work is expected to span five years includes: 30 days of 2D seismic survey, 45-60 days of 3D seismic survey, geohazard surveys in the Outer Continenal Shelf (OCS) (30 days), middle Cook Inlet subseawall area (14 days), and Trading Bay (30 days), exploratory wells in the OCS (40-60 days per well, 2-4 wells annually for three years) and Trading Bay (120-150 days), Iniskin Peninsula exploration and development (180 days annually for two years), platform and pipeline maintenance (180 days annually for five years), middle Cook Inlet well abandonment (90 days), and Drift River terminal decommissioning (120 days). The geographic area of Hilcorp's proposed activities covers approximately 2.7 million acres in Cook Inlet. The area extends from the north at the Susitna Delta on the west side (61º10'48 N, 151º0'55 W) and Point Possession on the east side (61º2'11 N, 150º23'30 W) to the south at Ursus Cove on the west side (59º26'20 N, 153º45'5 W) and Nanwalek on the east side (59º24'5 N, 151º56'30 W). These activities will occur in two primary areas within Cook Inlet, the lower Cook Inlet (south of the Forelands to Homer) and the middle Cook Inlet (north of the Forelands to Susitna/Point Possession). It includes land and adjacent waters in Cook Inlet including both State of Alaska and Federal OCS waters. See Figures 3 and 8 in Hilcorp's application which is available at https://www.fisheries.noaa.gov/action/incidental-take-authorization-hilcorp-alaska-llc-oil-and-gas-activities-cook-inlet-alaska.

[2] The term "take" means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." (16 U.S.C. §1362(3)(13))
[3] As defined in the MMPA for non-military readiness activities (Section 3(18)(A))

## 1.3 Purpose and Need

NMFS reviews applications and, if appropriate, issues incidental take authorizations pursuant to the MMPA and 50 CFR 216. To authorize the incidental take of marine mammals, NMFS evaluates the best available scientific information to determine whether the take would have a negligible impact on affected species or stocks and whether the activity would have an unmitigable adverse impact on the availability of the species or stocks for subsistence use. NMFS cannot issue authorizations if it would result in more than a negligible impact on marine mammal species or stocks or would result in an unmitigable adverse impact on the species or stocks for subsistence uses. NMFS must also prescribe the permissible methods of take and other means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance. All incidental take authorizations include additional requirements pertaining to monitoring and reporting.

Once NMFS determines an application is adequate and complete, NMFS has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. On October 8, 2018, NMFS determined Hilcorp submitted an adequate and complete application demonstrating the need and potential eligibility for a rulemaking under the MMPA. Thus, the purpose of NMFS' action—which is a direct outcome of Hilcorp's request for authorization to take marine mammals incidental to their proposed oil and gas exploration and development activities—is to evaluate the information in Hilcorp's application pursuant to the MMPA and 50 CFR 216 and issue an incidental take authorization, if appropriate. The need for NMFS' action is to consider the impacts of the exploration and development activities.

## 1.4 Environmental Review Process

Under NEPA, federal agencies are required to examine the environmental impacts of their proposed actions within the United States and its territories. A NEPA analysis is a concise public document that provides an assessment of the potential effects a major federal action may have on the human environment. Major federal actions include activities that federal agencies fully or partially fund, regulate, conduct or approve. Because NMFS issuance of an ITA (i.e., the regulations and LOA for Hilcorp) would allow for the taking of marine mammals, consistent with provisions under the MMPA and incidental to the applicant's lawful activities, NMFS considers this as a major federal action subject to NEPA; therefore, NMFS analyzes the environmental effects associated with authorizing incidental takes of protected marine mammal species and prepares the appropriate NEPA documentation. In addition, NMFS, to the fullest extent possible, integrates the requirements of NEPA with other regulatory processes required by law or by agency practice so that all procedures run concurrently, rather than consecutively. This includes coordination within the National Oceanic Atmospheric and Administration (NOAA), (e.g., the Office of the National Marine Sanctuaries) and with other regulatory agencies (e.g., the U.S. Fish and Wildlife Service), as appropriate, during NEPA reviews prior to implementation of a proposed action to ensure that requirements are met. Regarding the issuance of ITAs, NMFS relies substantially on the public process required by the MMPA for proposed ITAs to develop and evaluate relevant environmental information and provide a meaningful opportunity for public participation when NMFS prepares NEPA documents. NMFS considers public comments received in response to the publication of proposed ITA during the NEPA review process.

### 1.4.1 Scoping and Public Involvement

The NEPA process is intended to enable NMFS to make decisions based on an understanding of the environmental consequences and take actions to protect, restore, and enhance the environment. Although agency procedures do not require publication of the draft EA prior to finalizing an EA, NMFS relied substantially on the public process pursuant to the MMPA to develop and evaluate environmental information relevant to an analysis under NEPA. NMFS made the ITA application available for public review and comment on October 26, 2018 (83 FR 54088) and separately, published the proposed rule making in the Federal Register for review and comment on April 1, 2016 (84 FR 12330). There, NMFS alerted the public it intended to use the MMPA public review process for the proposed rulemaking to solicit relevant environmental information and provide the public an opportunity to submit comments. A draft EA was available on the internet along with the proposed rulemaking.

The Federal Register included a detailed description of the proposed action resulting from the MMPA ITA process; consideration of environmental issues and impacts of relevance related to the proposed rulemaking; and potential mitigation and monitoring measures to avoid and minimize potential adverse impacts to marine mammals and their habitat. The Federal Register notice of proposed rulemaking, the draft EA and the corresponding public comment period were are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments for our consideration in both the MMPA and NEPA decision-making processes.

During the 30-day public comment period following the publishing of the rulemaking, NMFS received a comment letter from the Marine Mammal Commission (Commission), several letters from non-governmental organizations (NGOs), a letter from the Cook Inlet Regional Citizens Advisotry Council, a letter from the International Association of Geophysical Contractors and several letters from the public. The Commission expressed concerns regarding calculation of duration, ensonified area, and exposure of marine mammals, which were amended for the final rule. The MMC also shared some concerns regarding certain seismic mitigation measures, which are also addressed in the final rule The NGOs, as well as the MMC, expressed concerns about the overall status of Cook Inlet belugas and suggested that NMFS refrain from issuing incidental take regulations until NMFS can say with certainty that issuance of these takes would not exacerbate the decline of the population. The public and certain NGO groups expressed concerns about the lack of cumulative impact analysis in the EA regarding this and other activities in Cook Inlet. Certain activities that were not included in the draft EA, which were raised during the public comment period, are now included in the Final EA. Comments received in response to the publication of the proposed rulemaking were considered and used to inform the analysis in this Final EA and to develop mitigation, monitoring and other conditions for the final rule and LOA. A more detailed summary of the comments, and NMFS' responses to those comments, is included in the Federal Register notice for the issued final rule and LOA.

## 1.5 Other Environmental Laws or Consultations

NMFS must comply with all applicable federal environmental laws and regulations necessary to implement a proposed action. NMFS evaluation of and compliance with environmental laws and regulations is based on the nature and location of the applicants proposed activities and NMFS proposed action. Therefore, this section only summarizes environmental laws and consultations applicable to NMFS' issuance of regulations to Hilcorp.

### 1.5.1 The Endangered Species Act

The ESA established protection over and conservation of threatened and endangered species (T&E) and the ecosystems upon which they depend. An endangered species is a species in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The USFWS and NMFS jointly administer the ESA and are responsible for the listing of species (designating a species as either threatened or endangered) and designating geographic areas as critical habitat for T&E species. The ESA generally prohibits the "take" of an ESA-listed species unless an exception or exemption applies. The term "take" as defined in section 3 of the ESA means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Section 7(a)(2) requires each federal agency to ensure that any action it authorizes, funds or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. When a federal agency's action may affect a listed species, that agency is required to consult with NMFS and/or the USFWS under procedures set out in 50 CFR Part 402. NMFS and USFWS can also be action agencies under section 7. Informal consultation is sufficient for species the action agency determines are not likely to be adversely affected if NMFS or USFWS concurs with the action agency's findings, including any additional measures mutually agreed upon as necessary and sufficient to avoid adverse impacts to listed species and/or designated critical habitat.

NMFS' issuance of regulations is a federal action that is also subject to the requirements of Section 7 of the ESA. As a result, we are required to ensure that the issuance of regulations to Hilcorp is not likely to jeopardize the continued existence of any T&E species or result in the destruction or adverse modification of designated critical habitat for these species. Because the Cook Inlet beluga whale, fin whale, humpback whale, and Steller sea lion are ESA-listed species with confirmed or possible occurrence in Cook Inlet, NMFS OPR Permits and Conservation Division initiated formal consultation with the NMFS' Alaska Regional Protected Resources Division on the proposed issuance of regulations to Hilcorp, pursuant to section 7 of the ESA, on December 3, 2018.

The formal consultation concluded and a final Biological Opinion (BiOp) was issued on June 18, 2019. The BiOp found that NMFS' proposed action is not likely to jeopardize the continued existence or recovery of Cook Inlet beluga whales, fin whales, the Western North Pacific and Mexico DPS of humpback whales, and the western DPS of Steller sea lions. This determination was made based on review of the status of the ESA-listed species, the environmental baseline within the action area, and the effects of the proposed action as well as effects of interrelated and interdependent actions and cumulative effects. Furthermore, NMFS AKR, PRD found that the proposed action is also not likely to adversely affect designated critical habitat for Cook Inlet beluga whales or the western DPS of Steller sea lion; thus, no destruction or adverse modification of designated critical habitat for these species is anticipated.

### 1.5.2 Magnuson-Stevens Fishery Conservation and Management Act

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. Although EFH was identified in Cook

Inlet for walleye Pollock, rock sole, Pacific cod, skate, weathervane scallop, Pacific salmon, and sculpin, we do not anticipate NMFS' proposed action of authorizing take of marine mammals and the associated mitigation and monitoring to impact EFH; therefore, an EFH consultation was not conducted.

## 1.6 Document Scope

This EA was prepared in accordance with NEPA (42 USC 4321, et seq.), CEQ Regulations CEQ Regulations (40 CFR 1500-1508) and NOAA policy and procedures (NAO 216-6A and the Companion Manual for the NAO 216-6A). The analysis in this EA addresses potential direct, indirect, and cumulative impacts to marine mammals and their habitat, resulting from NMFS' proposed action to authorize incidental take associated with the oil and gas activities proposed by Hilcorp. However, the scope of this analysis is limited to the decision for which we are responsible (*i.e.*, whether to issue the regulations and LOAs). This EA is intended to provide focused information on the primary issues and impacts of environmental concern, which is our issuance of the regulations authorizing the take of marine mammals incidental to Hilcorp's oil and gas exploration activities, and the mitigation and monitoring measures to minimize the effects of that take. For these reasons, this EA does not provide a detailed evaluation of the effects to the elements of the human environment listed in Table 1 below.

Table 1. Elements of the Environment Not Carried Forward for Analysis

| Biological | Physical | Socioeconomic/Cultural |
|---|---|---|
| Humans | Air Quality | Commercial Fishing |
| Fisheries Resources and Essential Fish Habitat | Farmland Geography | Historic and Cultural Resources |
| Invertebrates | Geology/sediments | Indigenous Cultural Resources |
| Invasive Species | Land Use | Low Income Populations |
| Marine and Coastal Birds | Oceanography | Military Activities |
| Sea Turtles | State Marine Protected Areas | Minority Populations |
| Threatened and Endangered Fishes | Federal Marine Protected Areas | National Historic Preservation Sites |
| Benthic Communities | National Estuarine Research Reserves | Other Marine Uses: Military activities, Shipping and marine transportation, and Boating |
| | National Marine Sanctuaries | Recreational Fishing |
| | National Wildlife Refuges | Public Health and Safety |
| | Park Land | |
| | Water Quality | |
| | Wetlands | |
| | Wild and Scenic Rivers | |

# Chapter 2 Alternatives

## 2.0 Introduction

The National Marine Fisheries Service (NMFS) Proposed Action is to issue regulations and a LOA to Hilcorp to authorize the take of small numbers of marine mammals incidental to the oil and gas exploration and development activities. NMFS' Proposed Action is triggered by Hilcorp's request for regulations per the Marine Mammal Protection Act (MMPA) of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.). In accordance with the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) Regulations, NMFS is required to consider a reasonable range of alternatives to a Proposed Action as well as the No action Alternative. The evaluation of alternatives under NEPA assists NMFS with ensuring that any unnecessary impacts are avoided through an assessment of alternative ways to achieve the purpose and need for our Proposed Action that may result in less environmental harm. . For the purposes of this EA, an alternative will only meet the purpose and need if it satisfies the requirements under section 101(a)(5)(A) of the MMPA. Therefore, NMFS applied the screening criteria and considerations outlined in Section 2.1 to the alternatives to identify which alternatives to carry forward for analysis.

## 2.1 Criteria and Considerations for Selecting Alternatives

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 adverse 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 uses ("least practicable adverse impact"). Consideration of the availability of marine mammal species or stocks for taking for subsistence uses pertains only to Alaska. NMFS does not have a regulatory definition for "least practicable adverse impact." However, NMFS' implementing regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)). In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, implementation of the measure(s) is expected to reduce impacts to marine mammal species or stocks, their habitat, and their availability for subsistence uses (when relevant). This analysis will consider such things as the nature of the potential adverse impact (such as likelihood, scope, and range), the likelihood that the measure will be effective if implemented, and the likelihood of successful implementation.

(2) The practicability of the measure for applicant implementation. Practicability of implementation may consider such things as cost, impact on operations, personnel safety, and practicality of implementation.

While the language of the least practicable adverse impact standard calls for minimizing impacts to affected species or stocks, we recognize that the reduction of impacts to those species or stocks accrues through the application of mitigation measures that limit impacts to individual animals. Accordingly, our analysis focuses on measures designed to avoid or minimize impacts on marine mammals from activities that are

likely to increase the probability or severity of population-level effects, including auditory injury or disruption of important behaviors, such as foraging, breeding, or mother/calf interactions. In order to satisfy the MMPA's least practicable adverse impact standard, we propose a suite of basic mitigation protocols that are required regardless of the status of a stock. Additional or enhanced protections are proposed for species whose stocks are in poor health and/or are subject to some significant additional stressor that lessens that stock's ability to weather the effects of the specified activity without worsening its status.

In the evaluation of specific measures, the details of the specified activity will necessarily inform each of the two primary factors discussed above (expected reduction of impacts and practicability), and will be carefully considered to determine the types of mitigation that are appropriate under the least practicable adverse impact standard. Analysis of how a potential mitigation measure may reduce adverse impacts on a marine mammal stock or species and practicability of implementation are not issues that can be meaningfully evaluated through a binary lens. The manner in which, and the degree to which, implementation of a measure is expected to reduce impacts, as well as its practicability in terms of these considerations, can vary widely. For example, a time/area restriction could be of very high value for decreasing population-level impacts (e.g., avoiding disturbance of feeding females in an area of established biological importance) or it could be of lower value (e.g., decreased disturbance in an area of high productivity but of less firmly established biological importance). Regarding practicability, a measure might involve operational restrictions that completely impede the operator's ability to acquire necessary data (higher impact), or it could mean additional incremental delays that increase operational costs but still allow the activity to be conducted (lower impact). Expected effects of the activity and of the mitigation as well as status of the stock all weigh into these considerations. Accordingly, the greater the likelihood that a measure will contribute to reducing the probability or severity of adverse impacts to the species or stock, the greater the weight that measure is given when considered in combination with practicability to determine the appropriateness of the mitigation measure, and vice versa. No quantitative formula is provided by the MMPA or by regulation, and it is not reasonable to expect an assessment of the mitigation required to achieve the least practicable adverse impact other than as described here.

The emphasis given to a measure's ability to reduce the impacts on a species or stock considers the degree, likelihood, and context of the anticipated reduction of impacts to individuals as well as the status of the species or stock. The ultimate impact on any individual from a disturbance event (which informs the likelihood of adverse species- or stock-level effects) is dependent on the circumstances and associated contextual factors, such as duration of exposure to stressors. Though any proposed mitigation needs to be evaluated in the context of the specific activity and the species or stocks affected, measures with the following types of goals are often applied to reduce the likelihood or severity of adverse species- or stock-level impacts:

- avoiding or minimizing injury or mortality;
- limiting interruption of known feeding, breeding, mother/calf, or resting behaviors;
- minimizing the abandonment of important habitat (temporally and spatially);
- minimizing the number of individuals subjected to these types of disruptions; and
- limiting degradation of habitat.

Mitigating these types of effects is intended to reduce the likelihood that the activity will result in energetic or other types of impacts that are more likely to result in reduced reproductive success or survivorship. It is

also important to consider the degree of impacts that were expected in the absence of mitigation in order to assess the benefit of any potential measures. Finally, because the least practicable adverse impact standard authorizes NMFS to weigh a variety of factors when evaluating appropriate mitigation measures, it does not compel mitigation for every kind of individual take, even when practicable for implementation by the applicant.

## 2.2 Description of Hilcorp's Proposed Activities

Hilcorp proposes to conduct oil and gas exploration, development, production, and decommissioning activities. The work expected to span five years includes: 30 days of 2D seismic survey, 45-60 days of 3D seismic survey, geohazard surveys in the Outer Continental Shelf (OCS) (30 days), middle Cook Inlet subseawall area (14 days), and Trading Bay (30 days), exploratory wells in the OCS (40-60 days per well, 2-4 wells annually for three years) and Trading Bay (120-150 days), Iniskin Peninsula exploration and development (180 days annually for two years), platform and pipeline maintenance (180 days annually for five years), middle Cook Inlet well abandonment (90 days), and Drift River terminal decommissioning (120 days).). The proposed activities listed in Table 2 and summarized herein are incorporated by reference from the application. Detailed descriptions of these activities are within the application on pages 1-33 and can be accessed on NMFS website at https://www.fisheries.noaa.gov/action/incidental-take-authorization-hilcorp-alaska-llc-oil-and-gas-activities-cook-inlet-alaska

**Table 2. Summary of planned activities included in ITR Petition.**

| **Updates from Table 1 in the proposed rule are reflected in bold.** | | | | | |
|---|---|---|---|---|---|
| **Project Name** | **Cook Inlet Region** | **Year(s) Planned** | **Seasonal Timing** | **Anticipated Duration** | **Antiicpated noise sources** |
| Anchor Point 2D seismic survey | Lower Cook Inlet, Anchor Point to Kasilof | 2021 or 2022 | April-October | 30 days **(10 days seismic)** | Marine: 1 source vessel with airgun **array**, 1 node vessel Onshore/Intertidal: shot holes, tracked vehicles, helicopters. |
| OCS 3D seismic survey | Lower Cook Inlet OCS | 2019 or **2020** | **April-October** | 45-60 days | 1 source vessel with airgun **array**, 2 support vessels, 1 mitigation vessel |
| OCS geohazard survey | Lower Cook Inlet OCS | 2020-2021 | April-October | 30 days | 1 vessel with echosounders and/or sub-bottom profilers |
| OCS exploratory wells | Lower Cook Inlet OCS | 2020-2022 | **February-November** | 40-60 days per well, 2-4 wells per year | 1 jack-up rig, drive pipe installation, vertical seismic profiling, 2-3 tugs for towing rig, support vessels, helicopters |
| Iniskin Peninsula exploration and development | Lower Cook Inlet, west side | **2020**-2022 | April-October | 180 days each year | Construction of causeway, vibratory sheet pile driving, dredging, vessels |
| Platform & pipeline maintenance | Middle Cook Inlet | 2019-2024 | April-October | 180 days **(each year)** | Vessels, water jets, hydraulic grinders, pingers, helicopters, and/or sub-bottom profilers No change |
| North Cook Inlet Unit subsea well geohazard survey | Middle Cook Inlet | 2020 | **April-October** | 14 days | 1 vessel with echosounders and/or sub-bottom profilers No change |
| North Cook Inlet Unit well abandonment activity | Middle Cook Inlet | 2020 | **April-October** | 90 days | 1 jack-up rig, tugs towing rig, support vessel, helicopters |
| Trading Bay area geohazard survey | Middle Cook Inlet | 2020 | **April-October** | 30 days | 1 vessel with echosounders and/or sub-bottom profilers |
| Trading Bay area exploratory wells | Middle Cook Inlet | 2020 | **April-October** | 120-150 days | 1 jack-up rig, drive pipe installation, vertical seismic profiling, tugs towing rig, support vessel, helicopters |
| **Granite Point production drilling and geohazard survey*** | **Middle Cook Inlet** | **2019** | **June-October** | **120-150 days** | **1 jack-up rig, tugs towing rig, support vessel, helicopters, 1 vessel with echosounders** |
| Drift River terminal decommissioning | Lower Cook Inlet, west side | **2020**-2023 | April-October | 120 days | Vessels |

### 2.2.1. 2D Seismic Survey

Based on potential future lease sales in both State and Federal waters, operators collect two-dimensional (2D) seismic data to determine the location of possible oil and gas prospects. Generally, 2D survey lines are spaced farther apart than three-dimensional (3D) surveys and are conducted in a regional pattern that provides less detailed geological information. 2D surveys are used to cover wider areas to map geologic structures on a regional scale. Airgun arrays sizes used during 2D surveys are similar to those used during 3D surveys.

During the time frame of this Petition, the region of interest to conduct a 2D survey is in the marine, intertidal, and onshore area on the eastern side of Cook Inlet from Anchor Point to Kasilof. The area of interest is approximately 8 km (5 miles) on each side of the coastline. The anticipated timing of the planned 2D survey is in the open water season (April through October) in either 2020 or 2021. The actual survey duration will take approximately 30 days in either year.

The 2D seismic data are acquired using airguns in the marine zone, airguns in the intertidal zone when the tide is high and drilled shot holes in the intertidal zone when the tide is low and drilled shot holes in the land zone. The data are recorded using an autonomous nodal system (i.e., no cables) that are deployed in the marine, intertidal, and land zones. The planned source lines (airgun and shot holes) are approximately 16 km (10 mi) in length running perpendicular to the coastline (Figure 3). The source lines are spaced every 8 km (5 mi) in between Anchor Point and Kasilof, with approximately 9-10 lines over the area of interest.

In the marine and high tide intertidal zones, data will be acquired using a shallow water airgun towed behind one source vessel. Although the precise volume of the airgun array is unknown at this time, Hilcorp will use an airgun array similar to what has been used for surveys in Cook Inlet by Apache (2011-2013) and SAExploration (2015): either a 2,400 cubic inch (cui) or 1,760 cui array. A 2,4000 cubic inch airgun was assumed for analysis in this final rule. In addition, the source vessel will be equipped with a 440 cui shallow water source which it can deploy at high tide in the intertidal area in less than 1.8 meter (6 feet) of water. Source lines are oriented along the node line. A single vessel is capable of acquiring a source line in approximately 1-2 hours (hrs). In general, only one source line will be collected in one day to allow for all the node deployments and retrievals, and intertidal and land zone shot holes drilling. There are up to 10 source lines, so if all operations run smoothly, there will only be 2 hr per day over 10 days of airgun activity. Hilcorp anticipates the entire operation to take approximately 30 days to complete to account for weather and equipment contingencies.

The recording system that will be employed is an autonomous system “nodal” (i.e., no cables), which is expected to be made up of at least two types of nodes; one for the land and one for the intertidal and marine environment. For the intertidal and marine zone, this will be a submersible multi-component system made up of three velocity sensors and a hydrophone. These systems have the ability to record continuous data. Inline receiver intervals for the node systems are approximately 50 m (165 ft). For 2D seismic surveys, the nodes are deployed along the same line as the seismic source. The deployment length is restricted by battery duration and data storage capacity. The marine nodes will be placed using one node vessel. The vessels required for the 2D seismic survey include just a source vessel and a node vessel.

In the marine environment, once the nodes are placed on the seafloor, the exact position of each node is required. In very shallow water, the node positions are either surveyed by a land surveyor when the tide is low, or the position is accepted based on the position at which the navigator has laid the unit. In deeper water, a hull or pole mounted pinger to send a signal to the transponder which is attached to each node will be used. The transponders are coded and the crew knows which transponder goes with which node prior to the layout. The transponders response (once pinged) is added together with several other responses to create a suite of range and bearing between the pinger boat and the node. Those data are then calculated to precisely position the node. In good conditions, the nodes can be interrogated as they are laid out. It is also common for the nodes to be pinged after they have been laid out. Onshore and intertidal locating of source and receivers will be accomplished with Differential Global Positioning System/roving units (DGPS/RTK) equipped with telemetry radios which will be linked to a base station established on the source vessel. Survey crews will have both helicopter and light tracked vehicle support. Offshore source and receivers will be positioned with an integrated navigation system (INS) utilizing DGPS/RTK link to the land base stations. The integrated navigation system will be capable of many features that are critical to efficient safe operations. The system will include a hazard display system that can be loaded with known obstructions, or exclusion zones.

### 2.2.2 3D Seismic Survey

During the time frame of this Petition, Hilcorp plans to collect 3D seismic data for approximately 45-60 days starting May 1, 2019 over 8 of the 14 OCS lease blocks in lower Cook Inlet. The 3D seismic survey is comprised of an area of approximately 790 km2 (305 mi2) through 8 lease blocks (6357, 6405, 6406, 6407, 6455, 6456, 6457, 6458). Hilcorp submitted an application for an Incidental Harassment Authorization (IHA) in late 2017 for a planned survey in 2018 but withdrew the application and now plan for the survey to take place in 2019. The survey program is anticipated to begin May 1, 2019 and last for approximately 45-60 days through June 2019 in compliance with identified BOEM lease stipulations. The length of the survey will depend on weather, equipment, and marine mammal delays (contingencies of 20% weather, 10% equipment, 10% marine mammal were assumed in this analysis).

Polarcus is the intended seismic contractor and the general seismic survey design is provided below. The 3D seismic data will be acquired using a specially designed marine seismic vessel towing between 8 and 12 ~2,400-m (1.5 mi) recording cables with a dual air gun array. The survey will involve one source vessel, one support vessel, one chase vessel, and potentially one mitigation vessel. The anticipated seismic source to be deployed from the source vessel is a 14-airgun array with a total volume of 1,945 in3. Crew changes are expected to occur every four to six weeks using a helicopter or support vessel from shore bases in lower Cook Inlet. The proposed seismic survey will be active 24 hours (hrs) per day. The array will be towed at a speed of approximately 7.41 km/hr (4 knots), with seismic data collected continuously. Data acquisition will occur for approximately 5 hours, followed by a 1.5-hour period to turn and reposition the vessel for another pass. The turn radius on the seismic vessel is approximately 3,200 m (2 mi).

The data will be shot parallel to the Cook Inlet shorelines in a north/south direction. This operational direction will keep recording equipment/streamers in line with Cook Inlet currents and tides and keep the equipment away from shallow waters on the east and west sides. The program may be modified if the survey cannot be conducted as a result of noise conditions onsite (i.e., ambient noise). The airguns will typically be turned off during the turns, however, depending on the daylight hours and length of the turn,

Hilcorp may use the smallest gun in the array (45 in3) as a mitigation airgun where needed. The vessel will turn into the tides to ensure the recording cables/streamers remain in line behind the vessel.
Hilcorp plans to use an array that provides for the lowest possible sound source to collect the target data.

The proposed array is a Bolt 1900 LLXT dual gun array. The airguns will be configured as two linear arrays or "strings;" each string will have 7 airguns shooting in a "flip-flop" configuration for a total of 14 airguns. The airguns will range in volume from 45 to 290 in3 for a total of 1,945 in3. The first and last are spaced approximately 14 m (45.9 ft) apart and the strings are separated by approximately 10 m (32.8 ft). The two airgun strings will be distributed across an approximate area of 30 x 14 m (98.4 x 45.9 ft) behind the source vessel and will be towed 300-400 m (984- 1,312 ft) behind the vessel at a depth of 5 m (16.4 ft). The firing pressure of the array is 2,000 pounds per square inch (psi). The airgun will fire every 4.5 to 6 seconds, depending on the exact speed of the vessel. When fired, a brief (25 milliseconds [ms] to 140 ms) pulse of sound is emitted by all airguns nearly simultaneously. Hilcorp proposes to use a single 45 in3 airgun, the smallest airgun in the array, for mitigation purposes.

Hilcorp intends to use 8 Sercel-type solid streamers or functionally similar for recording the seismic data (Figure 5). Each streamer will be approximately 2,400 m (150 mi) in length and will be towed approximately 8-15 m (26.2-49.2 ft) or deeper below the surface of the water. The streamers will be placed approximately 50 m (165 ft) apart to provide a total streamer spread of 400 m (1,148 ft). Hiclorp recognizes solid streamers as best in class for marine data acquisition because of unmatched reliability, signal to noise ratio, low frequency content, and noise immunity.

The survey will involve one source vessel, one support vessel, one or two chase vessel, and potentially one mitigation vessel. The source vessel tows the airgun array and the streamers. The support vessel provides general support for the source vessel, including supplies, crew changes, etc. The chase vessel monitors the in-water equipment and maintains a security perimeter around the streamers. The mitigation vessel provides a viewing platform to augment the marine mammal monitoring program.

### 2.2.3. Geohazard and Geotechnical Surveys

Upon completion of the 3D seismic survey over the lower Cook Inlet OCS leases, Hilcorp plans to conduct a geohazard survey on site-specific regions within the area of interest prior to conducting exploratory drilling. The precise location is not known, as it depends on the results of the 3D seismic survey, but the location will be within the lease blocks. The anticipated timing of the activity is in either the fall of 2019 or the spring of 2020. The actual survey duration will take approximately 30 days.

The suite of equipment used during a typical geohazards survey consists of single beam and multi-beam echosounders, which provide water depths and seafloor morphology; a side scan sonar that provides acoustic images of the seafloor; a sub-bottom profiler which provides 20 to 200 m (66 to 656 ft) sub-seafloor penetration with a 6- to 20-centimeter (cm, 2.4-7.9-inch [in]) resolution. Magnetometers, to detect ferrous items, may also be used. Geotechnical surveys are conducted to collect bottom samples to obtain physical and chemical data on surface and near sub-surface sediments. Sediment samples typically are collected using a gravity/piston corer or grab sampler. The surveys are conducted from a single support vessel.

The echosounders and sub-bottom profilers are generally hull-mounted or towed behind a single vessel. The ship travels at 3-4.5 knots (5.6-8.3 km/hr). Surveys are site specific and can cover less than one lease block in a day, but the survey extent is determined by the number of potential drill sites in an area. BOEM guidelines at NTL-A01 require data to be gathered on a 150 by 300 m (492 by 984 ft) grid within 600 m (1,969 ft) of the surface location of the drill site, a 300 by 600 m (984 by 1,969 ft) grid along the wellbore path out to 1,200 m (3,937 ft) beyond the surface projection of the conductor casing, and extending an additional 1,200 m beyond that limit with a 1,200 by 1,200 m grid out to 2,400 m (7,874 ft) from the well site.

The multibeam echosounder, single beam echosounder, and side scan sonar operate at frequencies of greater than 200 kHz. Based on the frequency ranges of these pieces of equipment and the hearing ranges of the marine mammals that have the potential to occur in the action area, the noise produced by the echosounders and side scan sonar are not likely to result in take of marine mammals and are not considered further in this document.

The geophysical surveys include use of a low resultion and high resolution sub-bottom profiler. The proposed high-resolution sub-bottom profiler operates at source level of 210 dB re 1 μPa RMS at 1 m. The proposed system emits energy in the frequency bands of 2 to 24 kHz. The beam width is 15 to 24 degrees. Typical pulse rate is between 3 and 10 Hz. The secondary low-resolution sub-bottom profiler will be utilized as necessary to increase sub-bottom profile penetration. The proposed system emits energy in the frequency bands of 1 to 4 kHz.

### 2.2.4 Exploratory Drilling

Operators will drill exploratory wells based on mapping of subsurface structures using 2D and 3D seismic data and historical well information. Hilcorp plans to conduct the exploratory drilling program April to October between 2020 and 2022. The exact start date is currently unknown and is dependent on the results of the seismic survey, geohazard survey, and scheduling availability of the drill rig. It is expected that each well will take approximately 40- 60 days to drill and test. Beginning in spring 2020, Hilcorp Alaska plans to possibly drill two and as many as four exploratory wells, pending results of the 3D seismic survey in the lower Cook Inlet OCS leases. After testing, the wells may be plugged and abandoned.
Hilcorp Alaska proposes to conduct its exploratory drilling using a rig similar to the Spartan 151 drill rig. The Spartan 151 is a 150 H class independent leg, cantilevered jack-up drill rig with a drilling depth capability of 7,620 m (25,000 ft) that can operate in maximum water depths up to 46 m (150 ft). Depending on the rig selection and location, the drilling rig will be towed on site using up to three ocean- going tugs licensed to operate in Cook Inlet. Rig moves will be conducted in a manner to minimize any potential risk regarding safety as well as cultural or environmental impact. While under tow to the well sites, rig operations will be monitored by Hilcorp and the drilling contractor management. Very High Frequency (VHF) radio, satellite, and cellular phone communication systems will be used while the rig is under tow. Helicopter transport will also be available.

Similarly to transiting vessels, although some marine mammals could receive sound levels in exceedance of the general acoustic threshold of 120 dB from the tugs towing the drill rig during this project, take is unlikely to occur, primarily because of the predictable movement of vessels and tugs. Marine mammal population density in the project area is low (see Estimated Take section below), and those that are present

are likely habituated to the existing baseline of commercial ship traffic. Further, there are no activity-, location-, or species-specific circumstances or other contextual factors that would increase concern and the likelihood of take from towing of the drill rig.

The drilling program for the well will be described in detail in an Exploration Plan to BOEM. The Exploration Plan will present information on the drilling mud program; casing design, formation evaluation program; cementing programs; and other engineering information. After rig up/rig acceptance by Hilcorp Alaska, the wells will be spudded and drilled to bottom-hole depths of approximately 2,100 to 4,900 m (7,000 to 16,000 ft) depending on the well. It is expected that each well will take about 40-60 days to drill and up to 10-21 days of well testing. If two wells are drilled, it will take approximately 80-120 days to complete the full program; if four wells are drilled, it will take approximately 160-240 days to complete the full program.

Primary sources of rig-based acoustic energy were identified as coming from the D399/D398 diesel engines, the PZ-10 mud pump, ventilation fans (and associated exhaust), and electrical generators. The source level of one of the strongest acoustic sources, the diesel engines, was estimated to be 137 dB re 1 µPa rms at 1 m in the 141-178 Hz bandwidth. Based on this measured level, the 120 dB rms acoustic received level isopleth would be 50 m (154 ft) away from where the energy enters the water (jack-up leg or drill riser). Drilling and well construction sounds are similar to vessel sounds in that they are relatively low-level and low-frequency. Since the rig is stationary in a location with low marine mammal density, the impact of drilling and well construction sounds produced from the jack up rig is expected to be lower than a typical large vessel. There is open water in all directions from the drilling location. Any marine mammal approaching the rig would be fully aware of its presence long before approaching or entering the zone of influence for behavioral harassment, and we are unaware of any specifically important habitat features (e.g., concentrations of prey or refuge from predators) within the rig's zone of influence that would encourage marine mammal use and exposure to higher levels of noise closer to the source. Given the absence of any activity-, location-, or species-specific circumstances or other contextual factors that would increase concern, we do not expect routine drilling noise to result in the take of marine mammals.

When planned and permitted operations are completed, the well will be suspended according to Bureau of Safety and Environmental Enforcement (BSEE) regulations. The well casings will be landed in a mudline hanger after each hole section is drilled. When the well is abandoned, the production casing is sealed with mechanical plugging devices and cement to prevent the movement of any reservoir fluids between various strata. Each casing string will be cutoff below the surface and sealed with a cement plug. A final shallow cement plug will be set to approximately 3.05 m (10 ft) below the mudline. At this point, the surface casing, conductor, and drive pipe will be cutoff and the three cutoff casings and the mudline hanger are pulled to the deck of the jack-up rig for final disposal. The plugging and abandonment procedures are part of the Well Plan which is reviewed by BSEE prior to being issued an approved Permit to Drill.

A drive pipe is a relatively short, large-diameter pipe driven into the sediment prior to the drilling of oil wells. The drive pipe serves to support the initial sedimentary part of the well, preventing the looser surface layer from collapsing and obstructing the wellbore. Drive pipes are installed using pile driving techniques. Hilcorp proposed to drive approximately 60 m of 76.2-cm pipe at each well site prior to drilling using a Delmar D62-22 impact hammer (or similar). This hammer has an impact weight of 6,200 kg (13,640 lbs). The drive pipe driving event is expected to last one to three days at each well site, although actual

pounding of the pipe will only occur intermittently during this period. Conductors are slightly smaller diameter pipes than the drive pipes used to transport or "conduct" drill cuttings to the surface. For these wells, a 50.8-cm [20-in] conductor pipe may be drilled, not hammered, inside the drive pipe, dependent on the integrity of surface formations.

Once the well is drilled, accurate follow-up seismic data may be collected by placing a receiver at known depths in the borehole and shooting a seismic airgun at the surface near the borehole, called vertical seismic profiling (VSP). These data provide high-resolution images of the geological layers penetrated by the borehole and can be used to accurately correlate original surface seismic data. The actual size of the airgun array is not determined until the final well depth is known, but typical airgun array volumes are between 600 and 880 cui. VSP typically takes less than two full days at each well site.

### 2.2.5 Iniskin Peninsula Exploration

Hilcorp Alaska initiated baseline exploratory data collection in 2013 for a proposed land-based oil and gas exploration and development project on the Iniskin Peninsula of Alaska, near Chinitna Bay. The proposed project is approximately 97 km (60 mi) west of Homer on the west side of Cook Inlet in the Fitz Creek drainage. New project infrastructure includes material sites, a 6.9 km (4.3 mi) long access road, prefabricated bridges to cross four streams, an air strip, barge landing/staging areas, fuel storage facilities, water wells and extraction sites, an intertidal causeway, a camp/staging area, and a drill pad. Construction is anticipated to start in 2020.

An intertidal rock causeway is proposed to be constructed adjacent to the Fitz Creek staging area to improve the accessibility of the barge landing during construction and drilling operations. The causeway will extend seaward from the high tide line approximately 366 m (1,200 ft) to a landing area 46 m (150 ft) wide. A dock face will be constructed around the rock causeway so that barges will be able to dock along the causeway. Rock placement for the causeway is not known to generate sound at levels expected to disturb marine mammals. The causeway is also not proposed at a known pinniped haulout or other biologically significant location for local marine mammals. Therefore, rock laying for the causeway is not considered further in this document.

The causeway will need to be 75% built before the construction of the dock face will start. The dock face will be constructed with 18-m (60-ft) tall Z-sheet piles, all installed using a vibratory hammer. It will take approximately 14-25 days, depending on the length of the work shift, assuming approximately 25% of the day actual pile driving. The timing of pile driving will be in late summer or early winter, after the causeway has been partially constructed. Illingworth & Rodkin (2007) compiled measured near-source (10 m [32.8 ft]) SPL data from vibratory pile driving for different pile sizes ranging in diameter from 30.5 to 243.8 cm (12 to 96 in).

### 2.2.6 Offshore Production Platforms

Of the 17 production platforms in central Cook Inlet, 15 are owned by Hilcorp.
Hilcorp performs routine construction on their platforms, depending on needs of the operations. Construction activities may take place up to 24 hrs a day. In-water activities include support vessels bringing supplies five days a week up to two trips per day between offshore systems at Kenai (OSK) and the

platform. Depending on the needs, there may also be barges towed by tugs with equipment and helicopters for crew and supply changes.

Hilcorp routinely conducts development drilling activities at offshore platforms on a regular basis to meet the asset's production needs. Development drilling activities occurs from existing platforms within the Cook Inlet through either open well slots or existing wellbores in existing platform legs. Drilling activities from platforms within Cook Inlet are accomplished by using conventional drilling equipment from a variety of rig configurations.

Some other platforms in Cook inlet have permanent drilling rigs installed that operate under power provided by the platform power generation systems, while others do not have drill rigs, and the use of a mobile drill rig is required. Mobile offshore drill rigs may be powered by the platform power generation (if compatible with the platform power system) or self-generate power with the use of diesel fired generators.

Helicopter logistics for development drilling programs operations will include transportation for personnel and supplies. The helicopter support will be managed through existing offshore services based at the OSK Heliport to support rig crew changes and cargo handling. Helicopter flights to and from the platform while drilling is occurring is anticipated to increase (on average) by two flights per day from normal platform operations.

Major supplies will be staged on-shore at the OSK Dock in Nikiski. Required supplies and equipment will be moved from the staging area to the platform in which drilling occurring by existing supply vessels that are currently in use supporting offshore operations within Cook Inlet. Vessel trips to and from the platform while drilling is occurring is anticipated to increase (on average) by two trips per day from normal platform operations. During mobile drill rig mobilization and demobilization, one support vessel is used continuously for approximately 30 days to facilitate moving rig equipment and materials.

### 2.2.7 Oil and Gas Pipeline Maintenance

Each year, Hilcorp Alaska must verify the structural integrity of their platforms and pipelines located within Cook Inlet. Routine maintenance activities include: subsea pipeline inspections, stabilizations, and repairs; platform leg inspections and repairs; and anode sled installations and/or replacement. In general, pipeline stabilization and pipeline repair are anticipated to occur in succession for a total of 6-10 weeks. However, if a pipeline stabilization location also requires repair, the divers will repair the pipeline at the same time they are stabilizing it. Pipeline repair activities are only to be conducted on an as-needed basis whereas pipeline stabilization activities will occur annually. During underwater inspections, if the divers identify an area of the pipeline that requires stabilization, they will place Sea-Crete bags at that time rather than waiting until the major pipeline stabilization effort that occurs later in the season.

Natural gas and oil pipelines located on the seafloor of the Cook Inlet are inspected on an annual basis using ultrasonic testing (UT), cathodic protection surveys, multi-beam sonar surveys, and sub-bottom profilers. Deficiencies identified are corrected using pipeline stabilization methods or USDOT-approved pipeline repair techniques. The Applicant employs dive teams to conduct physical inspections and evaluate cathodic protection status and thickness of subsea pipelines on an annual basis. If required for accurate measurements, divers may use a water jet to provide visual access to the pipeline. For stabilization,

inspection dive teams may place Sea-Crete bags beneath the pipeline to replace any materials removed by the water jet. Results of the inspections are recorded and significant deficiencies are noted for repair. Multi-beam sonar and sub-bottom profilers may also be used to obtain images of the seabed along and immediately adjacent to all subsea pipelines. Elements of pipeline inspections that could produce underwater noise include: the dive support vessel, water jet, multi-beam sonar/sub-bottom profiler and accompanying vessel.

A water jet is a zero-thrust water compressor that is used for underwater removal of marine growth or rock debris underneath the pipeline. The system operates through a mobile pump which draws water from the location of the work. Water jets likely to be used in Cook Inlet include, but are not limited to, the CaviDyne CaviBlaster® and the Gardner Denver Liqua-Blaster. Noise generated during the use of the water jets would be very short in duration (30 minutes or less at any given time) and intermittent.

If necessary, Hilcorp may use an underwater pipe cutter to replace existing pipeline segments in Cook Inlet. The following tools are likely to be used for pipeline cutting activities:

- A diamond wire saw used for remote cutting underwater structures such as pipes and I-Beams. These saws use hydraulic power delivered by a dedicated power source. The saw usually uses a method that pushes the spinning wire through the pipe.
- A hydraulically-powered Guillotine saw which uses an orbital cutting movement similar to traditional power saws.

Scour spans beneath pipelines greater than 23 m (75 ft) have the potential to cause pipeline failures. To be conservative, scour spans of 15 m (50 ft) or greater identified using multi-beam sonar surveys are investigated using dive teams. Divers perform tactile inspections to confirm spans greater than 15 m (50 ft). The pipeline is stabilized along these spans with Sea-Crete concrete bags. While in the area, the divers will also inspect the external coating of the pipeline and take cathodic protection readings if corrosion wrap is found to be absent. Elements of pipeline stabilization that could produce underwater noise include: dive support vessel and water jet.

Significant pipeline deficiencies identified during pipeline inspections are repaired as soon as practicable using methods including, but not limited to, USDOT-approved clamps and/or fiber glass wraps, bolt/flange replacements, and manifold replacements. In some cases, a water jet may be required to remove sand and gravel from under or around the pipeline to allow access for assessment and repair. The pipeline surface may also require cleaning using a hydraulic grinder to ensure adequate repair. If pipeline replacement is required, an underwater pipe cutter such as a diamond wire saw or hydraulically-powered Guillotine saw may be used. Elements of pipeline repair that could produce underwater noise include: dive support vessel, water jet, hydraulic grinder, and underwater pipe cutter.

### 2.6.8 Platform Leg Inspection and Repair

Hilcorp's platforms in Cook Inlet are inspected on a routine basis. Divers and certified rope access technicians visually inspect subsea platform legs. These teams also identify and correct significant structural deficiencies. Platform leg integrity and pipeline-to-platform connections beneath the water surface are evaluated by divers on a routine basis. Platform legs, braces, and pipeline-to-platform connections are evaluated for cathodic protection status, structure thickness, excessive marine growth, damage, and scour. If

required, divers may use a water jet to clean or provide access to the structure. If necessary, remedial grinding using a hydraulic under water grinder may be required to determine extent damage and/or to prevent further crack propagation. All inspection results are recorded and significant deficiencies are noted for repair. Elements of subsea platform leg inspection and repair that could produce underwater noise include: dive support vessel, hydraulic grinder, water jet.

Platform leg integrity along the tidal zone is inspected on a routine basis. Difficult-to-reach areas may be accessed using either commercially-piloted unmanned aerial systems (UAS). Commercially-piloted UASs may be deployed from the top-side of the platform to obtain images of the legs. Generally, the UAS is in the air for 15-20 minutes at a time due to battery capacity, which allows for two legs and part of the underside of the platform to be inspected. The total time to inspect a platform is approximately 1.5 hrs of flight time. The UAS is operated at a distance of up to 30.5 m (100 ft) from the platform at an altitude of 9-15 m (30-50 ft) above sea level. To reduce potential harassment of marine mammals, the area around the platform would be inspected prior to launch of the UAS to ensure there are no flights directly above marine mammals. As no flights will be conducted directly over marine mammals, the effects of drone use for routine maintenance are not considered further in this application.

### 2.6.9 North Cook Inlet Unit Subsea Well Plugging and Abandonment

The discovery well in the North Cook Inlet Unit was drilled over 50 years ago and is planned to be abandoned, so Hilcorp Alaska plans to conduct a geohazard survey to locate the well and conduct P&A activities for a previously drilled subsea exploration well in 2020. The geohazard survey location is approximately 402-804 m (¼-½ mi) south of the Tyonek platform and will take place over approximately seven days with a grid spacing of approximately 250 m (820 ft). The suite of equipment used during a typical geohazards survey consists of single beam and multi-beam echosounders, which provide water depths and seafloor morphology; a side scan sonar that provides acoustic images of the seafloor; a sub-bottom profiler which provides 20 to 200 m (66 to 656 ft) sub-seafloor penetration with a 6- to 20-cm (2.4-7.9-in) resolution. The echosounders and sub-bottom profilers are generally hull-mounted or towed behind a single vessel. The vessel travels at 3-4.5 knots (5.6-8.3 km/hr).

After the well has been located, Hilcorp plans to conduct plugging and abandonment activities over a 60-90 day time period in May through July in 2020. The jack-up rig will be similar to what is described above (the Spartan 151 drill rig, or similar). The rig will be towed onsite using up to three ocean-going tugs. Once the jack-up rig is on location, divers working off a boat will assist in preparing the subsea wellhead and mudline hanger for the riser to tie the well to the jack-up. Once the riser is placed, the BOP equipment is made up to the riser. At this point, the well will be entered and well casings will be plugged with mechanical devices and cement and then cutoff and pulled. A shallow cement plug will be set in the surface casing to 3.05 m (10 ft) below the mudline hanger. The remaining well casings will be cutoff and the mudline hanger will be recovered to the deck of the jack-up rig for disposal. The well abandonment will be performed in accordance to AOGCC regulations.

### 2.6.10 Trading Bay Exploratory Drilling

Hilcorp plans to conduct exploratory drilling activities in the Trading Bay area. The specific sites of interest have not yet been identified, but the general area is shown in Figure 3. Hilcorp will conduct geohazard

surveys over the areas of interest to locate potential hazards prior to drilling with the same suite of equipment as described above for exploratory drilling in the lower Inlet. The survey is expected to take place over 30-60 days in 2019 from a single vessel.

The exploratory drilling and well completion activities will take place in site-specific areas based on the geohazard survey. Hilcorp plans to drill 1-2 exploratory wells in this area in the open water season of 2020 with the same equipment and methods as described above for lower Inlet exploratory drilling. The noise of routine drilling is not considered further as explained in the description of activities in the Lower Inlet. However, drive pipe installation and vertical seismic profiling will be considered further.

## 2.3 Description of Alternatives

### 2.3.1 Alternative 1 – Issuance of Authorization with Mitigation, Monitoring, and Reporting

The proposed action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, NMFS would issue regulations and an LOA to Hilcorp allowing the incidental take, by Level A harassment and Level B harassment, of eleven species of marine mammals, consistent with the activities described in their application and subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the regulations and LOA.

Proposed Mitigation Measures Summary:

- Exclusion and safety zones - The Exclusion Zone (EZ) is defined as the area in which all operations are shut down in the event a marine mammal enters or is about to enter this zone based on distances to Level A or what can be effectively monitored for the species. The Safety Zone (SZ) is an area larger than the EZ and is defined as the area within which operations may power down in the event a marine mammal enters, is about to enter or may be considered a Level B harassment. For all activities, if a marine mammal for which take is not authorized is seen approaching the SZ, operations will shut down. A minimum 10 meter shutdown zone will be observed for all in-water construction and heavy machinery.

- NMFS proposes that Hilcorp shut down if a beluga is observed within the Level B zone during in-water noise-producing activity.

- NMFS proposes to require aerial overflights to clear the intended area of seismic survey activity of beluga whales on a daily basis. Hilcorp will fly over the action area searching for belugas not more than three hours prior to ramp up of seismic airguns and ramp up will not commence until the flights have confirmed the area appears free of beluga whales. This measure would only apply to 2D and 3D seismic surveying, not to other sound sources related to geohazard survey or well construction. If weather conditions are unsafe for flying, Hilcorp may begin seismic but must conduct the aerial survey as soon as weather allows.

- At least one on-duty protected species observer (PSO) must be monitoring for marine mammals from an additional mitigation vessel during seismic activity.

- Monitoring and carefully record any marine mammal behavior if a marine mammal is observed with the project area. No new operational activities would be started until the animal leaves the area. PSOs will also collect behavioral information on marine mammals beyond the safety zone.

- Abide by NMFS marine mammal viewing guidelines while operating vessels or land-based personnel

(for hauled-out pinnipeds), including not actively approaching marine mammals within 100 yards and slowing vessels to the minimum speed necessary. NMFS Alaska Marine Mammal Viewing Guidelines may be found at https://alaskafisheries.noaa.gov/pr/mm-viewing-guide.

- Hilcorp must not engage in noise-producing activities that are likely to exceed the 120 dB threshold within 10 miles (16 km) of the mean higher high water (MHHW) line of the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and October.

- No 2D seismic airgun activity before June within the level B radius (which maybe updated based on the SSV) of the Kasilof River.

Proposed monitoring and reporting measures:

- Utilize NMFS-qualified, vessel-based PSO to visually watch for and monitor marine mammals from vessels during mobile surveys (from nautical twilight-dawn to nautical twilight-dusk) or from platforms during drilling related activities.

- In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by these Authorizations, serious injury or mortality, all applicants shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, and the Alaska Regional Stranding Coordinators. The report must include the following information:

    - Time, date, and location (latitude/longitude) of the incident;
    - The name and type of vessel involved (if ship strike);
    - The vessel's speed during and leading up to the incident (if ship strike);
    - Description of the incident;
    - Status of all operational activities;
    - Water depth;
    - Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
    - Description of marine mammal observations in the 24 hours preceding the incident;
    - Species identification or description of the animal(s) involved;
    - The fate of the animal(s); and
    - Photographs or video footage of the animal (if equipment is available).
- Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with the applicants to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Applicants may not resume their activities until notified by NMFS via letter or email, or telephone.

- In the event that an applicant discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), applicants would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, designees, and the NMFS Alaska Stranding Hotline. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS would work with applicants to determine whether modifications in the activities are appropriate.

- In the event that an applicant discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the authorized activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage),

applicants shall report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, the NMFS Alaska Stranding Hotline, and the Alaska Regional Stranding Coordinators within 24 hours of the discovery. Applicants shall provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. Activities may continue while NMFS reviews the circumstances of the incident.

- Hilcorp will submit weekly and monthly reports to NMFS' Permits and Conservation Division and a final report within 90 days after the end of each project year. The monthly shall include a summary of marine mammal sightings and operations as well as PSO observer log sheets. The annual report will include:
    - Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);
    - Analyses of the effects of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare);
    - Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover; and
    - Analyses of the effects of authorized activities.

- NMFS will review the draft annual report. Applicants must submit a final annual report to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, within 30 days after receiving comments from NMFS on the draft annual report. If NMFS decides that the draft annual report needs no comments, the draft report shall be considered to be the final report.

#### 2.3.2. Alternative 2 – No Action Alternative

In accordance with NOAAs implementing procedures, the Companion Manual (CM) for NAO 216-6A, Section 6.B.i , NMFS is defining the No Action alternative as not authorizing the requested incidental take of marine mammals under Section 101(a)(5)(A) of the MMPA. This is consistent with our statutory obligation under the MMPA to either: (1) deny the requested authorization or (2) grant the requested authorization and prescribe mitigation, monitoring, and reporting requirements. Under the No Action Alternative, NMFS would not issue the regulations and LOA to Hilcorp, in which case we assume this applicant would not proceed with their proposed oil and gas activities as described in the application. The requested take would not occur and mitigation, monitoring and reporting for marine mammals would not be implemented. Although the No Action Alternative would not meet the purpose and need to allow incidental takes of marine mammals under certain conditions (i.e., when the statutory requirements are satisfied), the CEQ Regulations require consideration and analysis of a No Action Alternative for the purposes of presenting a comparative analysis to the action alternatives. The No Action Alternative, consistent with CEQ Guidance and the CM, serves as a baseline against which the impacts of the Preferred Alternative will be compared and contrasted.

# Chapter 3 Affected Environment

NMFS reviewed all possible environmental, cultural, historical, social, and economic resources based on the geographic location associated with NMFS proposed action and alternatives and the applicant's request for an incidental take authorization for the proposed oil and gas activities in Cook Inlet. Based on this review, this section describes the affected environment and existing (baseline) conditions for select resource categories (e.g., marine environment). As explained in Chapter 1, certain resource categories not affected by NMFS proposed action and alternatives were not carried forward for further consideration or evaluation in this EA (See Table 1) and where appropriate, the analysis in the final rule related to the marine environment is incorporated by reference. Chapter 4 provides an analysis and description of environmental impacts associated with the affected environment.

## 3.1 Physical Environment

Cook Inlet is a complex Gulf of Alaska estuary (as described in BOEM 2016) that covers roughly 7,700 square miles ($mi^2$; 20,000 square kilometers ($km^2$)), with approximately 840 miles (mi) (1,350 linear kilometer (km)) of coastline (Rugh *et al.*, 2000). The physical oceanography of Cook Inlet is characterized by complex circulation with variability at tidal, seasonal, annual, and inter-annual timescales (Musgrave and Statscewich, 2006). This region has the fourth largest tidal range in the world and as a result, extensive tidal mudflats that are exposed at low tides occur throughout Cook Inlet, especially in the upper reaches. The project area is located throughout Middle and Lower Cook Inlet, with activities like 3D seismic surveys taking place offshore, while 2D seismic and shallow hazard surveys would continue right up to the shoreline.

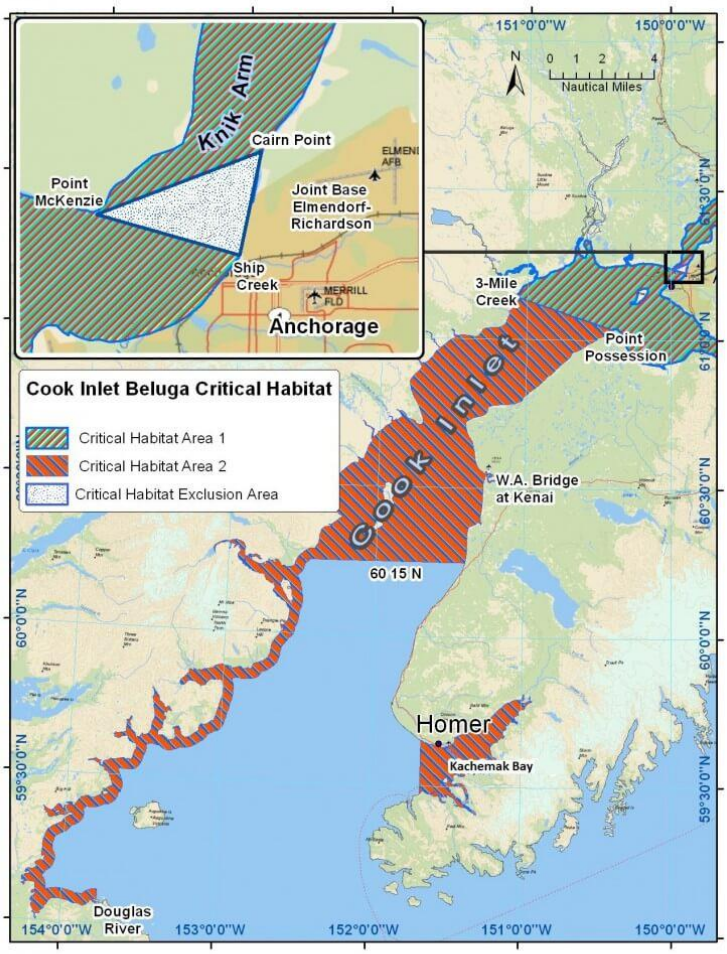
### 3.1.1. Marine Mammal Habitat

We presented information on marine mammal habitat and the potential impacts to marine mammal habitat in the final rule Federal Register notice. In summary, beluga whales, harbor porpoise, and harbor seals use the waters of Cook Inlet for foraging, calving, and other important life history functions. The mouths of river streams are important beluga whale feeding habitat. Harbor seals also use coastal haulouts in Cook Inlet. Killer whales, humpback whales, fin whales, minke whales, Dall's porpoise, gray whales, and Steller sea lions more commonly use the lower Cook Inlet area, which is outside the majority of the activity area. California sea lions are rarely seen in Cook Inlet but may occur more frequently in Cook Inlet due to changing climate conditions.

Pursuant to the ESA, critical habitat has been designated for Cook Inlet beluga whales (76 FR 20180) and Steller sea lions (58 FR 45269). However, Hilcorp's proposed oil and gas exploration and development activities will not occur within critical habitat designated for Steller sea lions. For Cook Inlet beluga whales, two areas (referred to as Critical Habitat Area 1 and Critical Habitat Area 2 and depicted in Figure 3) were designated and encompass 7,800 $km^2$ of marine and estuarine habitat in Cook Inlet. Designated beluga whale Critical Habitat Area 1 consists of 1,909 $km^2$ of Cook Inlet, north of Three Mile Creek and Point Possession. This includes shallow tidal flats or mudflats and mouths of rivers that provide important areas for foraging, calving, molting, and escape from predators. High concentrations of beluga whales are often observed in these areas from spring through fall. Critical Habitat Area 2 consists of 5,891 km2 located south of Critical Habitat Area 1 and includes nearshore areas along western Cook Inlet and Kachemak Bay. Critical Habitat Area 2 is a known fall and winter foraging and transit habitat

for beluga whales, as well as spring and summer habitat for smaller concentrations of beluga whales.

**Figure 1. Cook Inlet beluga whale Critical Habitat designations**




## 3.2 Biological Environment

### 3.1.1 Marine Mammals

The marine mammals most likely to be harassed incidental to conducting the oil and gas exploration and development activities are: Cook Inlet beluga whale, harbor seal, killer whale, harbor porpoise, gray whale, fin whale, minke whale, Dall's porpoise, humpback whale, California sea lion, and Steller sea lion (Shelden et al. 2003). While killer, fin, humpback, and gray whales and California and Steller sea lions have been sighted in upper Cook Inlet, their occurrence is considered rare. Cook Inlet beluga whales, harbor porpoises, and harbor seals are the species most likely to be sighted during the seismic program. Table 3 provides a summary of the abundance and status of the species likely to occur in the action area and Table 4 provides information on hearing ranges of these marine mammals. Information on the distribution, population size, and conservation status for each species was included in the proposed rule (84 FR 12330) and in Hilcorp's application. These documents contain detailed information on life history functions, hearing abilities, and distribution which is incorporated by reference in the following

subsections.

**Table 3. Abundance estimates, listing status, and information of the marine mammal species for which take is proposed to be authorized.**

| Common name | Scientific name | Stock | ESA/MMPA status; Strategic (Y/N)[1] | Stock abundance (CV, $N_{min}$, most recent abundance survey)[2] | PBR | Annual M/SI[3] |
|---|---|---|---|---|---|---|
| Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales) | | | | | | |
| Family Eschrichtiidae | | | | | | |
| Gray whale | *Eschrichtius robustus* | Eastern Pacific | -/-; N | 20,990 (0.05, 20,125, 2011) | 624 | 4.25 |
| Family Balaenopteridae (rorquals) | | | | | | |
| Fin whale | *Balaenoptera physalus* | Northeastern Pacific | E/D; Y | 3,168 (0.26,2,554 2013) | 5.1 | 0.4 |
| Minke whale | *Balaenoptera acutorostrata* | Alaska | -/-; N | N/A | N/A | 0 |
| Humpback whale | *Megaptera novaeangliae* | Western North Pacific | E/D; Y | 1,107 (0.3, 865, 2006) | 3 | 3.2 |
| Superfamily Odontoceti (toothed whales, dolphins, and porpoises) | | | | | | |
| Family Delphinidae | | | | | | |
| Beluga whale | *Delphinapterus leucas* | Cook Inlet | E/D; Y | 312 (0.1, 287, 2014) | 0.54 | 0.57 |
| Killer whale | *Orcinus orca* | Alaska Resident | -/-; N | 2,347 (N/A, 2,347, 2012) | 24 | 1 |
| | | Alaska Transient | -/-; N | 587 (N/A, 587, 2012) | 5.9 | 1 |
| Family Phocoenidae (porpoises) | | | | | | |
| Harbor porpoise | *Phocoena phocoena* | Gulf of Alaska | -/-; Y | 31,046 (0.214, N/A, 1998) | Undet | 72 |
| Dall's porpoise | *Phocoenoides dalli* | Alaska | -/-; N | 83,400 (0.097, N/A, 1993) | Undet | 38 |
| Order Carnivora – Superfamily Pinnipedia | | | | | | |
| Family Otariidae (eared seals and sea lions) | | | | | | |
| Steller sea lion | *Eumetopias jubatus* | Western | E/D; Y | 53,303 (N/A, 53,303, 2016) | 320 | 241 |
| California sea lion | *Zalophus californianus* | U.S. | -/-; N | 296,750 (153,337, N/A, 2011) | 9,200 | 331 |
| Family Phocidae (earless seals) | | | | | | |
| Harbor seal | *Phoca vitulina* | Cook Inlet/ Shelikof | -/-; N | 27,386 (25,651, N/A, 2011) | 770 | 234 |

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable [explain if this is the case]

3 - These values, found in NMFS' SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

*NOTE - Italicized species are not expected to be taken or authorized*

### 3.1.1 ESA-listed Marine Mammals

#### Cook Inlet Beluga Whale

A detailed description of the Cook Inlet beluga whales' biology, habitat, and extinction risk factors may be found in the endangered listing final rule for the species (73 FR 62919, October 22, 2008), the Conservation Plan for the Cook Inlet beluga whale (NMFS 2008a), and the Recovery Plan (NMFS 2016d). Additional information regarding Cook Inlet beluga whales can be found on the NMFS AKR web site at: http://alaskafisheries.noaa.gov/protectedresources/whales/beluga.htm. 1

The Cook Inlet beluga whale population was estimated at 1,300 whales in 1979 (Calkins 1989), but experienced a dramatic decline in the 1990s (Figure 9). This decline was attributed to overharvesting by subsistence hunting, which was then estimated to have removed 10 to 15 percent of the population per year. During 1994-1998 the population was documented to decline about 47 percent, from an estimated 653 to 347 whales (Hobbs et al. 2000). After measures were established in 1999 to regulate subsistence harvests, NMFS expected the population to grow at an annual rate of 2 to 6 percent. However, abundance estimates from the 1999-2008 aerial surveys showed the expected population growth did not occur. This led to the ESA listing of the Cook Inlet beluga whale in 2008 (73 FR 62919), and designation of critical habitat in 2011 (76 FR 20180, April 11, 2011). Although only five Cook Inlet beluga whales have been harvested since 1999 and none have been harvested since 2005, the population continues to decline. Data on the incidence of mortality from other sources is scant, precluding us from concluding whether continued population declines are due to increases in mortality or decreases in productivity. The 2014 population abundance estimate was 340 whales, indicating a 10 year decline of 0.4 percent per year (Shelden et al. 2015b). A recent 2016 population estimate is 328 individuals; however, further analyses are required to ascertain a valid population trend (NMFS, MML, Unpublished data, 2017).

Cook Inlet beluga whales reside in Cook Inlet year-round, which makes them geographically and genetically isolated from other beluga whale stocks in Alaska (Allen and Angliss 2015). Within Cook Inlet, they generally occur in shallow, coastal waters, often in water barely deep enough to cover their bodies (Ridgway and Harrison 1981). Although beluga whales remain year-round in Cook Inlet, they demonstrate seasonal movements within the inlet. During the summer and fall, beluga whales are concentrated near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay (Nemeth et al. 2007). During the winter, beluga whales concentrate in deeper waters in the mid-inlet to Kalgin Island, and in the shallow waters along the west shore of Cook Inlet to Kamishak Bay. Some whales may also winter in and near Kachemak Bay. Beluga whales are extremely social and often interact in close, dense groups. Most calving in Cook

Inlet is assumed to occur from mid-May to mid-July (Calkins 1984; NMFS unpublished data). The only known observed occurrence of calving occurred in mid-July, 2015, on the Susitna Delta, although newborn calves have been observed there from July to October (Dr. Tamara McGuire, LGL, Pers. Comm. March 27, 2017). Young beluga whales are nursed for two years and may continue to associate with their mothers for a considerable time thereafter (Reeves et al. 2002). 157BBeginning in 1993, aerial surveys have been conducted annually or biennially in June and August by NMFS Marine Mammal Laboratory (NMFS 2008a, Hobbs et al. 2011). Historic aerial surveys for beluga whales also were completed in the late 1970s and early 1980s (Harrison and Hall 1978, Murray and Fay 1979, Harza-Ebasco Susitna Joint Venture 1985). Results indicate that prior to the 1990s belugas used areas throughout the upper, mid, and lower Inlet during the spring, summer, and fall (Huntington 2000, Rugh et al. 2000, NMFS 2008a, Rugh et al. 2010a)(Figure 7). The distribution has since contracted northeastward into upper Cook Inlet, which is especially evident in the summer range (Rugh et al. 2000, Speckman and Piatt 2000, Hobbs et al. 2008, NMFS 2008a, Rugh et al. 2010a, Shelden et al. 2015a) (Figure 3).

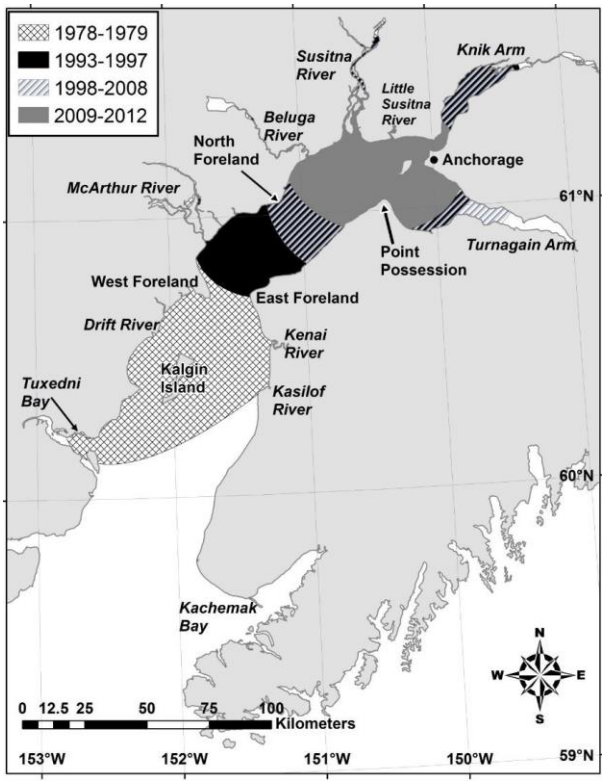



**Figure 3. Summer range contraction over time as indicated by ADF&G and NMFS aerial surveys. Adapted from Shelden et al. (2015a).**

This distributional shift and contraction coincided with the decline in abundance (Moore et al. 2000, NMFS 2008a, Goetz et al. 2012, NMFS 2015). Groups of over 200 individuals, including adults, juveniles, and neonates, have been observed in the Susitna Delta area alone (McGuire et al. 2014). NMFS refers to this preferred summer-fall habitat near the Susitna Delta as the Susitna Delta Exclusion Zone and seeks to minimize human activity in this area of extreme importance to Cook Inlet beluga whale survival and recovery. Goetz et al. (2012) modeled beluga use in Cook Inlet based on the NMFS aerial surveys conducted between 1994 and 2008. The combined model results indicate that lower densities of belugas are expected to occur in the action area. However, the area between Nikiski, Kenai, and Kalgin Island provides

important wintering habitat for Cook Inlet beluga whales. Use of this area would be expected between fall and spring, with animals present at lower densities during the ice-free months when oil and gas exploration surveys would occur (Goetz et al. 2012).

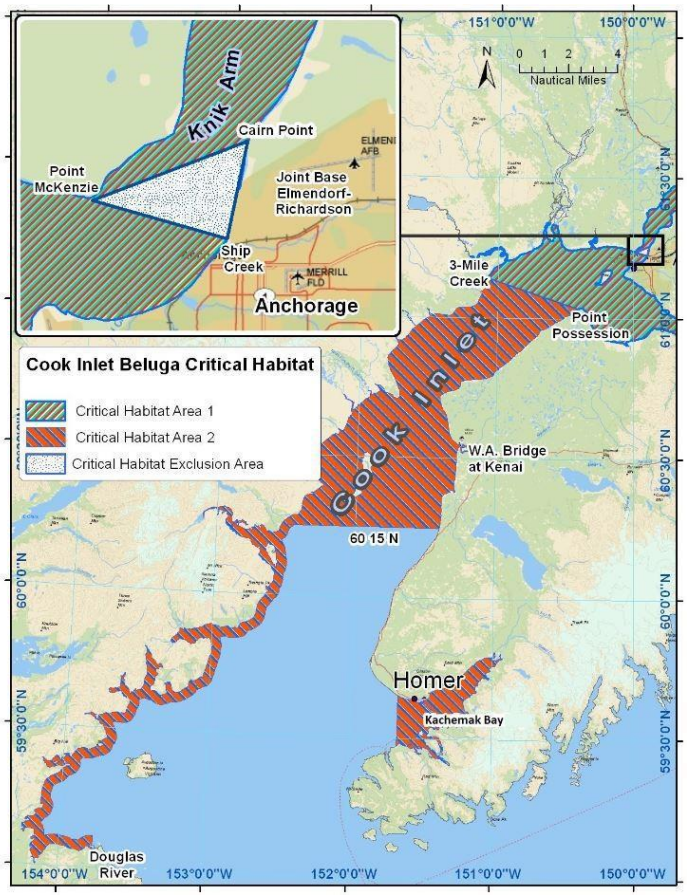



**Figure 4. Critical Habitat for Cook Inlet beluga whales.**

Critical Habitat Area 1 (Figure 4; green hashed area) is located in the northernmost region of Cook Inlet and consists of shallow tidal flats, river mouths, and estuarine areas. Area 1 is important as foraging and calving habitats, and beluga whales are concentrated in Area 1 during spring and summer months for these purposes. Area 1 also has the highest concentrations of beluga whales from spring through fall (approximately March through October), as well as the greatest potential for adverse impact from anthropogenic threats.

Critical Habitat Area 2 was designated for the area's importance to fall and winter feeding and transit. Area 2 includes the Cook Inlet waters south of Area 1 habitat, as well as Kachemak Bay and foraging areas along the western shore of lower Cook Inlet (Figure 4). Hilltop's activities will occur primarily in Area 2 of Cook Inlet beluga whale critical habitat that is primarily used by Cook Inlet belugas during the fall and winter months. Based on dive behavior and analysis of stomach contents from Cook Inlet belugas, it is assumed that Area 2 habitat is an active feeding area during fall and winter months when the spatial dispersal and diversity of winter prey likely influences the wider beluga winter range (NMFS 2008a). However, tagging data indicate use of Area 2 by belugas in all months except April and May, and the indicated absence of use of Area 2 in April and May is based upon tagging data from only 2 whales (MML unpublished data, April, 2017).

Cook Inlet beluga whales may be affected by a number of natural and manmade factors present in the action area. Many of these factors also have the potential to affect primary constituent elements of Cook Inlet beluga whale critical habitat. Natural threats to critical habitat include environmental variability, catastrophic events, competition for prey resources, and exposure to naturally occurring toxins (e.g., HABs). Anthropogenic threats to critical habitat include: 1) reductions in prey due to competition with fisheries; and 2) habitat loss or degradation resulting from exposure to toxic substances, presence of anthropogenic noise, continued coastal development, and presence of vessel traffic and tourism. These threats may occur individually or collectively (NMFS 2016d), and may affect essential physical and biological features of their designated critical habitats that are essential to their conservation.

Although belugas may have abandoned critical habitat off of the Kenai River during the peak periods of large salmon runs, they make heavy use of salmon runs elsewhere in Upper Cook Inlet, most notably using waters near the mouth of the Susitna and Beluga rivers, and rivers feeding into Knik Arm and Chickaloon Bay (Goetz et al. 2012). Salmon returns in Cook Inlet drainages remain strong, but fewer salmon runs may be available to belugas due to anthropogenic activity. Little information is available on salmon returns to those drainages most heavily exploited by Cook Inlet beluga whales, although limited salmon return counts for the Little Susitna River for Chinook, sockeye, and coho salmon since 1988 suggest no clear trend (http://www.alaskaoutdoorssupersite.com/salmon-run-charts).

**Fin Whale**

It is difficult to assess the current status of fin whales because (1) there is no general agreement on the size of the fin whale population prior to whaling and (2) estimates of the current size of the different fin whale populations vary widely. Prior to exploitation by commercial whalers, fin whales are thought to have numbered greater than 464,000 worldwide, and are now thought to number approximately 119,000 worldwide (Braham 1991). As used in this opinion, "populations" are isolated demographically, meaning, they are driven more by internal dynamics — birth and death processes — than by the geographic redistribution of individuals through immigration or emigration. Some usages of the term "stock" are synonymous with this definition of "population" while other usages of "stock" are not. To note, because the listing does not distinguish between stocks (or DPSs), all fin whale stocks are listed as endangered under the ESA.

Ohsumi and Wada (1974) estimated that the North Pacific fin whale population ranged from 42,000-45,000 before whaling began. Dedicated line transect cruises were conducted in coastal waters of western Alaska and the eastern and central Aleutian Islands in July-August 2001-2003 (Zerbini et al. 2009). Fin whale sightings (n = 276) were observed from east of Kodiak Island to Samalga Pass, with high aggregations recorded near the Semidi Islands. Zerbini et al. (2006) estimated that 1,652 (95 percent CI: 1,142-2,389) whales occurred in the area. An annual increase of 4.8 percent (95 percent CI: 4.1-5.4 percent ) was estimated for the period of 1987-2003 (Allen and Angliss 2015). The best estimate of the fin whale population west of the Kenai Peninsula is 1,368, the greater minimum estimates from the 2008 and 2010 surveys (Friday et al. 2013).

Recent information on seasonal fin whale distribution has been gleaned from the reception of fin whale calls by bottom-mounted, offshore hydrophone arrays along the U.S. Pacific coast, in the central North Pacific, and in the western Aleutian Islands (Moore et al. 1998, Watkins et al. 2000, Moore et al. 2006, Stafford et al. 2007, Širović et al. 2013, Soule and Wilcock 2013). Moore et al. (1998, 2006), Watkins et al. (2000), and Stafford et al. (2007) all documented high levels of fin whale call rates along the U.S. Pacific coast beginning in August/September and

lasting through February, suggesting that these may be important feeding areas during the winter. Fin whales have been acoustically detected in the Gulf of Alaska year-round, with highest call occurrence rates from August through December and lowest call occurrence rates from February through July (Moore et al. 2006, Stafford et al. 2007). However, fin whale sightings in Cook Inlet are rare. During the NMFS aerial surveys in 2001 through 2014, a total of nine groups (27 individuals) were reported, all of which were south of Kachemak Bay. Ferguson et al. (2015a), identified areas around Kodiak Island as a Biologically Important Area for fin whale feeding.

In the North Pacific overall, fin whales prefer euphausiids (mainly Euphausia pacifica, Thysanoessa longipes, T. spinifera, and T. inermis) and large copepods (mainly Calanus cristatus), followed by schooling fish such as herring, walleye pollock (Theragra chalcogramma), and capelin (Nemoto 1970, Kawamura 1982).

A migratory species, fin whales generally spend the spring and early summer feeding in cold, high latitude waters as far north as the Chukchi Sea, with regular feeding grounds in the Gulf of Alaska, Prince William Sound, along the Aleutian Islands, and around Kodiak Island, primarily on the western side. In the fall, fin whales tend to return to low latitudes for the winter breeding season, though some may remain in residence in their high latitude ranges if food resources remain plentiful. In the eastern Pacific, fin whales typically spend the winter off the central California coast and into the Gulf of Alaska. Panigada et al. (2006) found water depth to be the most significant variable in describing fin whale distribution, with more than 90 percent of sightings occurring in waters deeper than 2,000 m.

Feeding may occur in waters as shallow as 10 m when prey are at the surface, but most foraging is observed in high-productivity, upwelling, or thermal front marine waters (Gaskin 1972, Sergeant 1977, Nature Conservancy Council 1979 as cited in ONR 2001, Panigada et al. 2008).

There is considerable variation in grouping frequency by region. In general, fin whales, like all baleen whales, are not very socially organized, and most fin whales are observed as singles. Fin whales are also sometimes seen in social groups that can number 2 to 7 individuals. However, up to 50, and occasionally as many as 300, can travel together on migrations (NMFS 2010e). Fin whales in the Cook Inlet have only been observed as individuals or in small groups.

As with other vocalizations produced by baleen whales, the function of fin whale vocalizations is unknown, although there are numerous hypotheses (which include: maintenance of interindividual distance, species and individual recognition, contextual information transmission, maintenance of social organization, location of topographic features, and location of prey resources; see the review by (Thompson et al. 1992) for more information on these hypotheses). Responses to conspecific sounds have been demonstrated in a number of mysticetes, and there is no reason to believe that fin whales do not communicate similarly (Edds-Walton 1997). The low frequency sounds produced by fin whales have the potential to travel over long distances, and it is possible that long-distance communication occurs in fin whales (Payne and Webb 1971, Edds- Walton 1997). Also, there is speculation that the sounds may function for long-range echolocation of large-scale geographic targets such as seamounts, which might be used for orientation and navigation (Tyack 1999).

While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is anticipated to be between 7 Hz to 35 kHz (NMFS 2016f). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. In a study of the morphology of the mysticete auditory apparatus, Ketten (1997) hypothesized that large mysticetes have acute infrasonic (low pitch) hearing. Synthetic audiograms produced by applying models to X-ray computed tomography scans of a fin whale calf skull indicate the range of best hearing for fin whale calves to range from approximately 0.02 to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

**Humpback Whale**

NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The Western North Pacific (WNP) DPS (which includes a small proportion of humpback whales found in the action area) is listed as endangered; the Mexico DPS (which includes a small proportion of humpback whales found in the action area) is listed as threatened; and the Hawaii DPS (which includes most humpback whales found in the action area) is not listed (81 FR 62260; September 8, 2016). Critical habitat has not been designated for the Western North Pacific or Mexico DPSs.

Humpback whales migrate seasonally between warmer, tropical or sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate or sub-Arctic waters in summer months (where they feed). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters; during their seasonal migrations; however, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

In recent years, humpback whales have been regularly observed in lower and mid Cook Inlet, especially in the vicinity of Elizabeth Island, Iniskin and Kachemak Bays, and north of Anchor Point (Shelden et al. 2013). Of a total 83 humpback whales observed by NMFS during Cook Inlet beluga aerial surveys conducted from 1993-2012, only 5 were observed as far north as the Anchor Point area (Shelden et al. 2013) (Figure 12), which is within the action area.

Humpback whales have been known to occur within the Gulf of Alaska primarily in summer and fall, migrating to southerly breeding grounds in winter and returning to the north in spring (Calambokidis et al. 2008). However, based on recordings from moored hydrophones deployed in six locations in the Gulf of Alaska from October 1999 to May 2002, humpback calls were most commonly detected during the fall and winter (Stafford et al. 2007).

During the 2014 Apache seismic surveys occurring throughout State waters of Cook Inlet, a total of five groups (six individuals) were spotted by the marine mammal observers (Lomac-MacNair et al. 2014). Two humpbacks were observed in May and June, 2015, during marine mammal monitoring from Furie's gas platform the Julius R., located about 10 mi south of Tyonek (Jacobs Engineering 2017). Additional opportunistic sightings of a single humpback (or mother-calf pair) in the vicinity of Turnagain Arm, in upper Cook Inlet, was reported in 2014 (NMFS 2016a). Shortly thereafter, a dead humpback, likely the same animal, was found in the same area, suggesting that this anomalous animal may have entered the area in a compromised state. In 2016, one humpback whale stranded in Turnagain Arm near Hope (NMFS unpublished data).

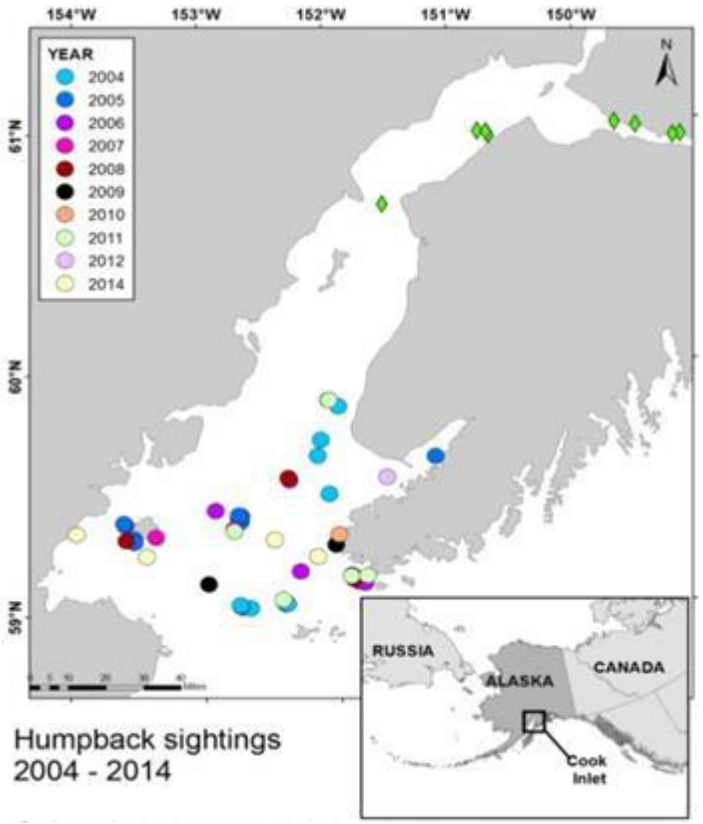



**Figure 5. Humpback whale observations, as documented in Cook Inlet, 1994-2014. Green diamonds indicate opportunistic (and anomalous) sightings of a single whale, or possibly of an adult whale and calf, during April 25-May 1, 2014. Map created 3/12/2015 by Linda Vate Brattstrom, Marine Mammal Lab, NMFS, NOAA.**

Based on both sighting data and acoustic detections, some humpback whales are known to occur year-round in the Gulf of Alaska, although they occur in higher numbers during summer (Stafford et al. 2007, Baumann-Pickering et al. 2012, Debich et al. 2013). Humpback whale occurrence in the action area during the summer time period is considered likely. Ferguson et al. (2015a) identified areas around Kodiak Island, partially within the action area, as a Biologically Important Area for humpback whale feeding.

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970b, Tyack and Whitehead 1983b, Payne and Payne 1985, Silber 1986c, Thompson et al. 1986a, Richardson et al. 1995b, Au 2000, Frazer and Mercado III 2000, Erbe 2002a, Au et al. 2006b, Vu et al. 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016f). Humpback whales produce sounds less frequently in their summer feeding areas. Feeding groups produce distinctive sounds ranging from 20 Hz to 2 kHz, with median durations of 0.2-0.8 seconds and source levels of 175-192 dB (Thompson et al. 1986b). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent et al. 1985, Sharpe and Dill 1997).

**Steller Sea Lion**

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs based on genetic studies and other information (62 FR 24345; May 5, 1997). At that time, the eastern DPS was listed as threatened, and the western DPS was

listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66140). The western DPS remains listed as endangered. Information on Steller sea lion biology, threats, and habitat (including critical habitat) is available online at: http://alaskafisheries.noaa.gov/protectedresources/stellers/default.htm and in the revised Steller Sea Lion Recovery Plan (NMFS 2008b), which can be accessed at: https://alaskafisheries.noaa.gov/sites/default/files/sslrpfinalrev030408.pdf . All Steller sea lions in the action area are expected to belong to the western DPS.

Steller sea lions do not migrate, but they often disperse widely outside of the breeding season (Loughlin 1997). Because of their polygynous breeding behavior, in which individual, adult male sea lions will breed with a large number of adult females, Steller sea lions have clearly-defined social interactions. Steller sea lions are gregarious animals that often travel or haul out in large groups of up to 45 individuals (Keple 2002). At sea, groups usually consist of females and subadult males as adult males are usually solitary (Loughlin 2002). King (1983) reported rafts of several hundred Steller sea lions adjacent to haulouts.

Kastelein et al. (2005) also described the underwater vocalizations of Steller sea lions, which include belches, barks, and clicks. The underwater audiogram of the male Steller sea lion in their study had a maximum hearing sensitivity at 77 dB RL at 1kHz. His range of best hearing, at 10dB from the maximum sensitivity, was between 1 and16 kHz. His average pre-stimulus responses occurred at low frequency signals. The female Steller sea lion's maximum hearing sensitivity, at 73 dB received level, occurred at 25 kHz. These authors concluded that low frequency sounds are audible to Steller sea lions. However, because of the small number of animals tested, the findings could not be attributed to individual differences in sensitivity or sexual dimorphism (Kastelein et al. 2005b).

While Critical Habitat has been designated for the WDPS of Steller sea lions, there is no overlap between Hilcorp's proposed activities and the Critical Habitat designations.

Dominant prey items vary with region and season, but the most significant groundfish prey items for Steller sea lions in the western DPS are Atka mackerel, pollock, Pacific cod, and arrowtooth flounder, each of which have at least a 10 percent frequency of occurrence in the Steller sea lion diet (NMFS 2010b).

### 3.1.2 Non-ESA Listed Marine Mammals

#### Harbor Seal

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet. In general, harbor seals are more abundant in lower Cook Inlet than in upper Cook Inlet, but they do occur in the upper inlet throughout most of the year (Rugh et al. 2005). Harbor seals are non-migratory; their movements are associated with tides, weather, season, food availability, and reproduction. The major haulout sites for harbor seals are located in lower Cook Inlet, and their presence in the upper inlet coincides with seasonal runs of prey species. For example, harbor seals are commonly observed along the Susitna River and other tributaries along upper Cook Inlet during the eulachon and salmon migrations (NMFS, 2003). During aerial surveys of upper Cook Inlet in 2001, 2002, and 2003, harbor seals were observed 24 to 96 km (15 to 60 mi) south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga Rivers (Rugh et al., 2005).

The Cook Inlet/Shelikof Stock is distributed from Anchorage into lower Cook Inlet during summer and from lower Cook Inlet through Shelikof Strait to Unimak Pass during winter (Boveng et al. 2012). Large numbers concentrate at the river mouths and embayments of lower Cook Inlet, including the Fox River

mouth in Kachemak Bay, and several haul outs have been identified on the southern end of Kalgin Island in lower Cook Inlet (Rugh et al. 2005; Boveng et al. 2012). Montgomery et al. (2007) recorded over 200 haul-out sites in lower Cook Inlet alone. During Apache's 2012 seismic program, harbor seals were observed in the project area from early May until the end of the seismic operations in late September (Lomac-MacNair et al. 2013). Also in 2012, up to 100 harbor seals were observed hauled out at the mouths of the Theodore and Lewis rivers during monitoring activity associated with Apache's 2012 Cook Inlet seismic program. During Apache's 2014 seismic program, 492 groups of harbor seals (613 individuals) were observed. This was the highest sighting rate of any marine mammal observed during the summer of 2014 (Lomac-MacNair et al. 2014). During SAExploration's 2015 seismic survey, 823 sightings (1,680 individuals) were observed north and between the Forelands (Kendall et al. 2015). Hilcorp recently reported 313 sightings of 316 harbor seals while conducting pipeline work in upper Cook Inlet (Sitkiewicz et al. 2018).

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice, and feed on capelin, eulachon, cod, pollock, flatfish, shrimp, octopus, and squid in marine, estuarine, and occasionally fresh waters.

**Killer Whale**

Numbers of killer whales in Cook Inlet are small compared to the overall population and most are recorded in the lower Cook Inlet. Two different stocks of killer whales inhabit the Cook Inlet region of Alaska: the Alaska Resident Stock and the Gulf of Alaska, Aleutian Islands, Bering Sea Transient Stock (Muto et al 2017). Seasonal and year-round occurrence has been noted for killer whales throughout Alaska (Braham and Dahlheim 1982), where whales have been labeled as "resident," "transient," and "offshore" type killer whales (Dahlheim et al. 2008; Ford et al. 2000). The killer whales using Cook Inlet are thought to be a mix of resident and transient individuals from two different stocks: the Alaska Resident Stock, and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock (Allen and Angliss 2015).

Killer whales are rare in upper Cook Inlet, where transient killer whales are known to feed on beluga whales, and resident killer whales are known to feed on anadromous fish (Shelden et al. 2003). The availability of these prey species largely determines the likeliest times for killer whales to be in the area. Twenty-three sightings of killer whales were reported in the lower Cook Inlet between 1993 and 2004 in aerial surveys by Rugh et al. (2005a). Surveys over 20 years by Shelden et al. (2003) reported 11 sightings in upper Cook Inlet between Turnagain Arm, Susitna Flats, and Knik Arm. No killer whales were spotted during surveys by Funk et al. (2005), Ireland et al. (2005), Brueggeman et al. (2007a, 2007b, 2008), or Prevel Ramos et al. (2006, 2008). Eleven killer whale strandings have been reported in Turnagain Arm, six in May 1991, and five in August 1993. One killer whale group of two individuals was observed during the 2015 SAExploration seismic program near the North Foreland (Kendall et al. 2015). Very few killer whales, if any, are expected to approach or be in the vicinity of the seismic survey operations area.

**Harbor Porpoise**

The range of the Gulf of Alaska stock includes the entire Cook Inlet, Shelikof Strait, and the Gulf of Alaska. Harbor porpoises have been reported in lower Cook Inlet from Cape Douglas to the West Foreland, Kachemak Bay, and offshore (Rugh et al. 2005a). Although they have been frequently observed during aerial surveys in Cook Inlet (Shelden et al. 2014), most sightings are of single animals, and are concentrated at Chinitna and Tuxedni bays on the west side of lower Cook Inlet (Rugh et al. 2005) and in the upper inlet.

Small numbers of harbor porpoises have been consistently reported in the Upper Cook Inlet between April and October, except for a recent survey that recorded higher numbers than typical. Highest monthly counts

include 17 harbor porpoises reported for spring through fall 2006 by Prevel Ramos et al. (2008), 14 for spring of 2007 by Brueggeman et al. (2007a), 12 for fall of 2007 by Brueggeman et al. (2008), and 129 for spring through fall in 2007 by Prevel Ramos et al. (2008) between Granite Point and the Susitna River during 2006 and 2007; the reason for the recent spike in numbers (129) of harbor porpoises in the upper Cook Inlet is unclear and quite disparate with results of past surveys, suggesting it may be an anomaly. The spike occurred in July, which was followed by sightings of 79 harbor porpoise in August, 78 in September, and 59 in October in 2007. The number of porpoises counted more than once was unknown. Therefore, because we lack information regarding double counting, it is possible that the actual numbers are smaller than reported. On the other hand, recent passive acoustic research in Cook Inlet by Alaska Department of Fish and Game (ADF&G) and the Marine Mammal Laboratory (MML) have indicated that harbor porpoises occur more frequently than expected, particularly in the West Foreland area in the spring (Castellote et al. 2016), although overall numbers are still unknown at this time. Hilcorp recently reported 29 sightings of 44 harbor porpoises while conducting pipeline work in upper Cook Inlet (Sitkiewicz et al. 2018).

**Dall's Porpoise**

Dall's porpoise are widely distributed across the entire North Pacific Ocean, with one of the only known gaps in their distribution being Upper Cook Inlet (Allen & Angliss, 2012). Their preference is for deep ocean water, which is not the bathymetry found in Cook Inlet. However, they were included in the applicant's request for take because they have been sighted occasionally in lower Cook Inlet. Dall's porpoises were observed (2 groups, 3 individuals) during Apache's 2014 seismic survey which occurred in the summer months (Lomac-MacNair et al. 2014). Dall's porpoises were observed during the month of June in 1997 (Iniskin Bay), 199 (Barren Island), and 2000 (Elizabeth Island, Kamishak Bay and Barren Island) (Shelden et al. 2013). Dall's porpoises have been observed in lower Cook Inlet, including Kachemak Bay and near Anchor Point (Owl Ridge 2014). One Dall's porpoise was observed in August north of Nikiski in the middle of the Inlet during SAExploration's 2015 seismic program (Kendall et al. 2015).

**Minke Whale**

Numbers of minke whales are very small compared to other species considered in this project. One minke whale was sighted during a NMFS aerial survey in 2006, with anecdotal records of additional minke sightings more recently (NMFS, 2012). Minke whales are much more common in the Bering and Chuckchi Seas, but they are not considered abundant in inshore Gulf of Alaska waters (Allen & Angliss, 2012). Very little is known about the Alaska stock structure, but their low levels of human-related removals and frequent sightings in Alaska waters mean they are not considered strategic, despite a lack of population information.

During Cook Inlet-wide aerial surveys conducted from 1993 to 2004, minke whales were encountered three times (1998, 1999, and 2006), both times off Anchor Point 16 miles northwest of Homer (Shelden et al. 2013, 2015, 2017). A minke whale was also reported off Cape Starichkof in 2011 (A. Holmes, pers. comm.) and 2013 (E. Fernandez and C. Hesselbach, pers. comm.), suggesting this location is regularly used by minke whales, including during the winter. Several minke whales were recorded off Cape Starichkof in early summer 2013 during exploratory drilling (Owl Ridge 2014), suggesting this location is regularly used by minke whales year-round. During Apache's 2014 survey, a total of 2 minke whale groups (3 individuals) were observed during this time period, one sighting to the southeast of Kalgin Island and another sighting near Homer (Lomac-MacNair et al. 2014). SAExploration noted one minke whale near Tuxedni Bay in 2015 (Kendall et al. 2015). This species is unlikely to be seen in upper Cook Inlet but may be encountered in the mid and lower Inlet.

**Gray Whale**

Numbers of gray whales in Cook Inlet are small compared to the overall population, but Apache observers recorded nine sightings of nine individuals (including possible resights of the same animals) from May-July 2012. Of those sightings, seven were observed from project vessels, and two were observed from land; no animals were observed during aerial surveys. ). Though most gray whales migrate past Cook Inlet, small numbers have been noted by fishers near Kachemak Bay, and north of Anchor Point (BOEM 2015). During the NMFS aerial surveys, gray whales were observed in the month of June in 1994, 2000, 2001, 2005 and 2009 on the east side of Cook Inlet near Port Graham and Elizabeth Island but also on the west side near Kamishak Bay (Shelden et al. 2013). One gray whale was sighted as far north at the Beluga River. Additionally, summering gray whales were seen offshore of Cape Starichkof by marine mammal observers monitoring Buccaneer's Cosmopolitan drilling program in 2013 (Owl Ridge 2014). During Apache's 2012 seismic program, nine gray whales were observed in June and July (Lomac- MacNair et al. 2013). During Apache's seismic program in 2014, one gray whale was observed (Lomac- MacNair et al. 2014). During SAExploration's seismic survey in 2015, no gray whales were observed (Kendall et al. 2015). The eastern North Pacific gray whales observed in Cook Inlet are likely migrating to summer feeding grounds in the Bering, Chukchi, and Beaufort seas, though a small number feed along the coast between Kodiak Island and northern California (Matkin 2009; Carretta et al. 2014).

**California sea lion**

There have been relatively few California sea lions observed in Alaska, most are often alone or occasionally in small groups of two or more and usually associated with Steller sea lions at their haulouts and rookeries (Maniscalco et al. 2004). California sea lions are not typically observed farther north than southeast Alaska, and sightings are very rare in Cook Inlet. California sea lions have not been observed during the annual NMFS aerial surveys in Cook Inlet. However, a sighting of two California sea lions was documented during for the Apache 2012 seismic survey (Lomac-MacNair et al. 2013). Additionally, NMFS' anecdotal sighting database has four sightings in Seward and Kachemak Bay.

## 3.3 Socioeconomic Environment

### 3.3.1 Subsistence

Near the proposed activities, Tyonek is a Dena'ina Athabascan village practicing a subsistence lifestyle. The Village of Tyonek lies on a bluff on the northwest shore of Cook Inlet and has no interconnected road access. According to Census 2010, there were 144 housing units in the community and 70 were occupied. Its population was 88.3 percent American Indian or Alaska Native; 5.3 percent white; 6.4 percent of the local residents had multi-racial backgrounds (ADCCE 2010). The principal wild foods harvested and consumed by Dena'ina communities are fish, land mammals (moose), and marine mammals. Salmon consistently provides the major portion of the region's subsistence food, and sockeye is the most harvested. Shellfish, plants, and birds and eggs each make up approximately 2% of the total annual harvest (BOEM 2003).

Native hunters historically have hunted beluga whales and harbor seals for food. The subsistence harvest of beluga transcends nutritional and economic value of the whale as the harvest is an integral part of the cultural identity of the region's Alaska Native communities. Inedible parts of the whale provide Native artisans with materials for cultural handicrafts, and the hunting perpetuates Native traditions by

transmitting traditional skills and knowledge to younger generations. However, due to dramatic declines in the Cook Inlet beluga whale population, on May 21, 1999, legislation was passed to temporarily prohibit (until October 1, 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected Alaska Native Organizations (ANOs) (Public Law No. 106-31, section 3022, 113 Stat. 57,100). That prohibition was extended indefinitely on December 21, 2000 (Public Law No. 106-553, section 1(a)(2), 114 Stat. 2762). NMFS subsequently entered into six annual co-management agreements (2000-2003, 2005-2006) with the Cook Inlet Marine Mammal Council, an ANO representing Cook Inlet beluga hunters, which allowed for the harvest of 1-2 belugas. On October 15, 2008, NMFS published a final rule that established long-term harvest limits on the Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibited harvest for a five-year period (2008-2012), if the average abundance for the Cook Inlet beluga whales from the prior five years (2003-2007) was below 350 whales. There was no beluga harvest during the most recent five year period (2013-2017), as the previous five-year average (2008-2012) was not above 350 whales.

Hilcorp Alaska has developed a Stakeholder Engagement Plan (SEP) and will implement this plan throughout the duration of the Petition. The SEP will help coordinate activities with local stakeholders and thus subsistence users, minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the subsistence hunts. The Plan is provided in Appendix B of Hilcorp's application. Presentations will be given at various local forums. Hilcorp Alaska is working with a contractor to update/verify our existing stakeholder list. Meetings and communication will be coordinated with: commercial and sport fishing groups/associations, various Native fisheries and entities as it pertains to subsistence fishing and/or hunting, marine mammal co-management groups, Cook Inlet Regional Citizens Advisory Council, local landowners, government and community organizations, and environmental NGOs.

There is a low level of subsistence hunting for harbor seals in Cook Inlet. Seal hunting occurs opportunistically among Alaska Natives who may be fishing or travelling in the upper Inlet near the mouths of the Susitna River, Beluga River, and Little Susitna River. Some detailed information on the subsistence harvest of harbor seals is available from past studies conducted by the Alaska Department of Fish & Game (Wolfe et al., 2009). In 2008, only 33 harbor seals were taken for harvest in the Upper Kenai-Cook Inlet area. In the same study, reports from hunters stated that harbor seal populations in the area were increasing (28.6%) or remaining stable (71.4%). The specific hunting regions identified were Anchorage, Homer, Kenai, and Tyonek, and hunting generally peaks in March, September, and November (Wolfe et al., 2009).

# Chapter 4 Environmental Consequences

The National Marine Fisheries Service (NMFS) reviewed all possible direct, indirect, cumulative, short-term, and long-term impacts to marine mammals and their habitat associated with NMFS' action and alternatives. This chapter describes the potential environmental consequences for the affected resources described in Chapter 3 for each alternative

### 4.1.1. Effects of Alternative 1 – Issuance of Authorizations with Mitigation Measures

Alternative 1 is the Preferred Alternative where we would issue a rulemaking to Hilcorp allowing the incidental take, by Level A and Level B harassment, of eleven species of marine mammals, subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the rule (see Section 2.3.1).

### 4.1.2. Impacts to Marine Mammal Habitat

The proposed activities would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitat. Drilling-related activities (e.g., trenching, pulling the pipes, dive work, etc.) would minimally and briefly (limited to when work is occurring at a particular location) impact physical habitat features, such as substrates and/or water quality. The drill platforms would be somewhat permanent structures; however, any impact from these activities on the seafloor is limited to the footprint of the drill rig and we expect benthic organisms to grow on the material left in place. Impacts from seismic and geohazard surveys on marine mammal habitat would be less direct. While sound being periodically introduced to the environment could alter the acoustic habitat, these sources and their vessels would not make contact with the substrate or alter the water quality in the project area. Additionally, these technologies will be used at slack tide periods, making the effects of seismic airguns and sub-bottom profilers period and limited to short time periods centered around slack tides. Vessels used for the project would originate from the Alaska area; therefore, the potential for ballast water to contain non-indigenous species that may be introduced or spread into the marine environment is low.

Physical Disturbance—The planned geophysical surveys do not include seafloor placement of anchors, nodes, cables, sensors, or other equipment, and therefore the surveys are not expected to result in any physical damage to habitat. However, the drilling portions of Hilcorp's activity may potentially alter physical benthic habitat in localized areas surrounding potential well sites.

Marine mammal species in Cook Inlet primarily exploit prey resources in the water column, although examination of beluga stomach contents have revealed the presence of some benthic fauna. Aspects of the proposed action have the potential to cause seafloor disturbance, turbidity, and discharge that may impact marine mammal benthic prey species. Seafloor disturbance can occur from sediment sampling, placement and removal of equipment on the seafloor, and discharge of drilling waste during geotechnical surveys and exploratory drilling activities. Seafloor disturbance and scour can also occur from bottom founded anchors associated with exploratory drilling operations. Based on expected water depths in the project area and recent exploration activities in the state waters of Cook Inlet, it is likely that a jack up rig

will be employed for exploration drilling. Areas of seafloor may be disturbed by placement and removal of jack-up rigs and anchors.

There is the potential for seafloor disturbance to impact Cook Inlet beluga due to temporary disturbance and resuspension of sediments in the water column, including areas within five miles of anadromous fish streams. Because the marine mammals that may be harassed from Hilcorp's action are not benthic feeders, or feed on benthic fauna only rarely, we do not expect these animals will be exposed to disturbances to the benthic environment.

Effects on Prey—Marine mammal prey selection varies by species, sex, reproductive status, distribution of both marine mammals and prey, and other factors. Primary prey types include fish, cephalopods, and planktonic species, though marine mammal prey type is unknown for some species. Like marine mammals, it is well documented that fish utilize sound production for a variety of key biological life functions, including mating, spawning, habitat selection, and more (e.g., Mann et al., 2010; Wall, Lembke, and Mann, 2012; Fine and Parmentier, 2015).

Invertebrates appear to be able to detect sounds (Pumphrey, 1950; Frings and Frings, 1967) and are most sensitive to low-frequency sounds (Packard et al., 1990; Budelmann and Williamson, 1994; Lovell et al., 2005; Mooney et al., 2010). Available data suggest that cephalopods are capable of sensing particle motion, and detect low frequencies up to 1-1.5 kHz, depending on the species, and so are likely to detect airgun noise (Kaifu et al., 2008; Hu et al., 2009; Mooney et al., 2010; Samson et al., 2014). There is a growing body of literature that increased anthropogenic noise, including from geophysical surveys, is known to cause cessation in vocalization, habitat displacement, and injury and sometimes death in fish (McCauley et al., 2003; Slotte et al., 2004; Fewtrell and McCauley 2012), cephalopods (André et al., 2011), and invertebrates (Day et al., 2017). Some studies also found negative impacts to catch rates during

or after airgun surveys (Løkkeborg and Vold Soldal 1993; Engås et al., 1996). Other studies, however, have not found impacts to fish (Peña et al., 2013)—which could be due to a number of factors such as habituation to airgun noise and/or fidelity to feeding and/or current patterns.

Based on current literature, the most likely impact to prey from airgun surveys is temporary avoidance of habitat. Surveys using towed airgun arrays move through an area relatively quickly, limiting exposure to multiple impulsive sounds. In all cases, sound levels would return to ambient once a survey ends and the noise source is shut down. When exposure to sound ends, behavioral and/or physiological responses are expected to end relatively quickly (McCauley et al., 2000b). As described in the final rule, due to the transient nature of the surveys and the prescribed mitigation, any other impacts to prey are not expected to be permanent or adverse.

Major studies regarding effects of geotechnical and geophysical surveys on pretty include the following: Streever et al. (2016) documented a general decline in fish catches during airgun surveys (although catches closest to the sound source showed declines, those further away showed increases, suggesting general displacement); Paxton et al. (2017) documented noise from an airgun survey along the inner

continental shelf of North Carolina, where noise exceeded 170 dB re 1 μPa peak on two temperate reefs 0.7 and 6.5 km from the survey ship path; the authors documented declines in fish abundance during surveys. McCauley

et al. (2017) documented that zooplankton densities decreased in net tows by 64% within an hour of airgun exposure, and caused a two-to-threefold increase in dead adult and larval zooplankton. While we recognize that these studies show impacts to potential prey species for marine mammals, or in the case of McCauley et al. (2017), support food chains, it is difficult to draw direct conclusions from these studies regarding how Hilcorp's activities will directly and indirectly affect prey. These studies were conducted over varied geographic areas, time periods, environmental conditions, and survey dynamics, and indicate the need for further study regarding these issues.

No appreciable adverse impacts on benthic populations from Hilcorp's test and production drilling activities would be expected due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortalities or impacts that might occur as a result of the proposed action is immaterial compared to the naturally occurring high reproductive and mortality rates of benthic organisms (BOEM 2015a). In addition, disturbed areas, depending on substrate types, community

composition, and ocean current speed and direction, would begin the process of recolonization after deposition has completed following the benthic disturbance (Conlan and Kvitek 2005, BOEM 2015a). Amphipods, copepods, shrimp, nematodes, and polychaetes are among the first to recolonize, taking generally less than a year for establishment in new locations (Trannum et al. 2011).

Only localized turbidity is expected to occur as a result of the proposed drilling related activities. This turbidity is expected to dissipate rapidly in the inlet's strong tidal currents. Furthermore, in the highly turbid waters of Cook Inlet, increases in turbidity would be nearly imperceptible at the onset. Seafloor disturbance from anchor handling activities is anticipated to fill in through natural movement of sediment over time. Disturbance associated with excavation or exploration/delineation wells is anticipated to temporarily impact a small area of habitat which would soon be re-colonized by benthic organisms. Based on the above, we would not expect adverse effects to listed species from bottom sampling activities and would consider this stressor to be minor or minimal overall.

Acoustic Habitat— The acoustic soundscape comprises an important component of marine mammal habitat. Animals produce sound for, or listen for sounds produced by conspecifics (communication during feeding, mating, and other social activities), other animals (finding prey or avoiding predators), and the physical environment (finding suitable habitats, navigating). Baseline information on the acoustic soundscape and general ambient sound levels within the zone of influence are not well defined and vary across spatiotemporal scales, but it can be reasonably expected that surveys will increase acoustic energy into the localized environment. The low-frequency sounds produced by airguns can propagate across large distances in the water column, with distance and speed depending on a range of conditions such as salinity, bottom type, temperature, etc. (Hildebrand, 2009). Airgun signals have been detectable at great distances from their source. In one study, Nieukirk et al. (2012) observed that airgun sounds were detected at the Mid-Atlantic Ridge almost 4,000 km away from their source. They note, however, that

hydrophones were located in the deep sound channel, where conditions are more favorable for attenuation (Nieukirk et al., 2012). Studies in other areas documented that airgun surveys increased background noise by 30-45 dB within a kilometer of activity, by 10-25 dB within 15 km of activity, and by a few dB at 128 km (Guerra et al., 2011).

As described previously, the prescribed time-area restriction is intended to protect important habitat from increases in noise. Closure of the Susitna River Delta exclusion zone during periods of high use by beluga whales is intended to minimize impacts to the acoustic environment in areas known to be biologically important to the population.

#### 4.1.3. Impacts to Marine Mammals

Impacts to marine mammals from anthropogenic noise, including airguns, can be grouped into three main categories: behavioral disruption, masking, and physical or physiological impacts (Nowacek et al., 2007). Broadly, this ranges from hearing loss (temporary or permanent), increased stress response, habitat displacement, changes to behavioral patterns (e.g., increased swimming speed, shorter dive duration), masking, injury, to even death in certain circumstances not present here (Richardson et al., 1995; Weilgart 2007).

1. Threshold Shift—Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), or the loss of hearing sensitivities at certain frequencies (Nowacek et al., 2007; Finneran, 2015). TS can be permanent (PTS), where the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case an individual's hearing threshold can recover with time (Southall et al., 2007). Repeated exposure leading to TTS can also lead to PTS (Weilgart 2007). If PTS occurs, there is physical damage to sound receptors.

Currently, TTS data only exist for four species of cetaceans: bottlenose dolphin, beluga whale (Delphinapterus leucas), harbor porpoise, and Yangtze finless porpoise (Neophocoena asiaeorientalis), which were exposed to a limited number of sound sources (i.e., mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). In general, harbor porpoises have a lower TTS onset than other studied cetacean species (Finneran, 2015), but little remains known on the exact frequencies and conditions for onset of TTS and PTS (Finneran, 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes.

Critical questions remain regarding the rate of TTS growth and recovery after exposure to intermittent noise and the effects of single and multiple pulses. Data at present are also insufficient to construct generalized models for recovery and determine the time necessary to treat subsequent exposures as independent events. More information is needed on the relationship between auditory evoked potential and behavioral measures of TTS for various stimuli. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall et al. (2007), Finneran and Jenkins (2012), Finneran (2015), and NMFS (2018).

2. Behavioral Effects—Behavioral disturbance can occur via many forms, including subtle changes in behavior (e.g., brief avoidance of an area or changes in vocalizations), longer-time changes in behavior, or more potentially long-term and severe responses. Behavioral responses to sound are highly variable and context-specific, and any reactions depend on numerous intrinsic and extrinsic factors (e.g., species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (e.g., Richardson et al., 1995; Wartzok et al., 2003; Southall et al., 2007;

Weilgart, 2007; Archer et al., 2010).

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al., 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. Behavioral disturbance can include: habitat displacement or avoidance (McCauley et al., 2000a; Forney et al., 2017), habituation to a sound source (Gordon et al., 2003), or decreases in vocalization. For example, several studies have observed cessation or changes in fin whale calls (e.g.. Castellote et al., 2012; Cerchio et al., 2014) and in bowhead whale calls during their fall migration in the Alaskan Beaufort Sea, at distances of 41 to 45 km exposed to median received levels (SPL) of at least 116 dB re 1 μPa (Blackwell et al., 2013). In contrast, other studies documented increases in blue whale call production amidst received levels of 131 dB re 1 μPa2-s, potentially indicating blue whales attempting to "compensate" for increases in background noise levels (Di Iorio and Clark, 2010). Other studies show airgun avoidance for bowhead whales at distances of 20 km or more at received sound levels of 120-130 dB rms during use of airgun arrays (Richardson et al., 1999). Thus, available studies show wide variation in response to underwater sound, and the degree of impact depends on many factors, including behavioral state, reproductive state, distance to the sound source, and more.

3. Stress Responses—Other impacts include both stress response (Wright et al., 2007; Rolland et al., 2012) and chronic stress from repeated exposure to a sound source (NRC, 2003; Wright et al., 2011), both of which can carry consequences for fitness and health. Additionally, an animal experiencing TTS is likely to experience a stress response (NRC, 2003). An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (e.g., Seyle, 1950; Moberg, 2000). Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and freeranging animals (e.g., Holberton et al., 1996; Hood et al., 1998; Jessop et al., 2003; Krausman et al., 2004; Lankford et al., 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (e.g., Fair and Becker, 2000; Romano et al., 2002b) and, more rarely, studied in wild populations (e.g., Romano et al., 2002a). For example, Rolland et al., (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

4. Auditory Masking—Geophysical surveys also have the ability to cause auditory masking, whereby the receipt of sound can be interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may impact an animal's ability to detect or discriminate between vital acoustic signals (Richardson et al., 1995; Gordon et al., 2003; Compton et al., 2008; Nieukirk et al., 2012). The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (e.g., signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (e.g., sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

It is important to note that masking, which broadly involves marine mammals being unable to receive or distinguish between acoustic signals in the presence of noise of similar frequencies, differs from PTS and

TTS, which involve hearing loss or damage to the animal. As with PTS and TTS, characteristics of the noise source, distance from the source, an individual's behavioral and physiological state, and more influence the magnitude of potential masking. Masking can result in consequences to the animal, such as changes in vocalization, increased energetic costs, reduction in communication space, and more (e.g., Clark et al., 2009; Di Iorio and Clark, 2009).

5. Non-Acoustic Impact—Non-acoustic impacts to marine mammals are discussed here, but considered to be unlikely. One potential impact to marine mammals from the proposed activity is vessel strike. Vessel collisions with marine mammals, or ship strikes, can result in death or serious injury of the animal. Wounds resulting from ship strike may include massive trauma, hemorrhaging, broken bones, or propeller lacerations (Knowlton and Kraus, 2001). The severity of injuries typically depends on the size and speed of the vessel, with the probability of death or serious injury increasing as vessel speed increases (Knowlton and Kraus, 2001; Laist et al., 2001; Vanderlaan and Taggart, 2007; Conn and Silber, 2013).

Vessel strike is of particular concern for mysticetes, as historical records show that most vessel strikes occur to fin, humpback, NARW, gray, minke, and other large whales (Laist et al., 2001; Jensen and Silber 2003; Vanderlaan et al., 2007). While NMFS recognizes vessel strike is a significant concern for marine mammals, the prescribed Vessel Strike Avoidance measures such as reducing vessel speeds and course corrections will liekly reduce the potential of ship strikes for marine mammals in Cook Inlet.

Other non-acoustic impacts also include entanglement from vessels and towed equipment associated with survey activity. NMFS is not aware of any associations of marine mammals becoming entangled with geophysical survey gear.

#### 4.1.3. Estimated Take of Marine Mammals by Level A and Level B Incidental Harassment

We estimate take by considering: 1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; 2) the area of water that will be ensonified above these levels in a day; 3) the density or occurrence of marine mammals within these ensonified areas; and, 4) and the number of days of activities. Using the best available science, NMFS uses acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

For stationary sources, we estimate the ensonified area to be a circle centered at the point of the drill rig, constituting the distance calculated to the relevant 160 dB or 120 dB threshold from each sound source. For mobile sources, Hilcorp provided an estimate of the length of track line to be covered per day and the area of the trackline to be ensonified each day was calculated to multiply by density. For sources like 3D seismic surveying, which is conducted in closely placed lines with ensonified areas that overlap the previous trackline, Hilcorp provided an estimated area in square kilometers that would be ensonified each day, which was then multiplied by marine mammal densities. For every source, an ensonified area was derived, which was then multiplied by the density of marine mammals. This was then multiplied by the number of days that activity was expected to occur.

Take estimates were generated in consideration of species density in the action area (Table 4), number of days each activity would occur, the extent of ensonified area, and group size and frequency of assumed

occurrence. The two latter parameters were considered if the calculated take estimate based on density was not representative of group size. For example, if calculated take was one animal but that species is typically observed in groups of 5 animals, we increased the number of take to represent a certain number of groups. Calculated take is the product of daily ensonified area, number of days for each activity type, and the density of a species, absent mitigation measures or other requirements and limiting factors. More details on how takes were derived can be found in our notice of final rule. Take of marine mammals that NMFS is proposing to authorize in its rule is summarized below (Table 5).

**Table 4. Density Estimates for Marine Mammals Potentially Present within the Action Area based on Cook Inlet-wide NMFS aerial surveys 2001-2016.**

| Species | Estimated Density (# marine mammals/km$^2$)[3] |
|---|---|
| Beluga whale<br>Lower and Middle Cook Inlet[1]<br>Lower Cook Inlet[2]<br>North Cook Inlet Unit[2]<br>Trading Bay area[2]<br>Iniskin Peninsula[2] | <br>0.00006<br>0.01111<br>0.00166<br>0.01505<br>0.02436 |
| Humpback whale | 0.00189 |
| Minke whale | 0.00001 |
| Gray whale | 0.0008 |
| Fin whale | 0.00031 |
| Killer whale | 0.00064 |
| Dall's porpoise | 0.00016 |
| Harbor porpoise | 0.00468 |
| Harbor seal | 0.24871 |
| Steller sea lion | 0.00811 |

[1]NMFS aerial survey combined lower and middle Cook Inlet density
[2]Goetz *et al*. 2012(b) habitat-based model density
[3]When using data from NMFS aerial surveys, the survey year with the greatest calculated density was used to calculate exposures.
No density available for California sea lions in Cook Inlet.

**Table 5. Estimated maximum exposures that may be authorized for each species in a single year.**

| Species | Level A | | | Level B | | |
|---|---|---|---|---|---|---|
| | Annual Estimated Exposures | Annual Takes Requested | % of Population | Annual Estimated Exposures | Annual Takes Requested | % of Population |
| Humpback whale | 6.81 | 7 | 0.81% | 87.26 | 90 | 10.40% |
| Minke whale | 0.04 | 0 | 0.00% | 0.46 | 5 | 0.41% |
| Gray whale | 0.29 | 0 | 0.00% | 3.68 | 5 | 0.02% |
| Fin whale | 1.19 | 1 | 0.10% | 15.31 | 15 | 1.64% |
| Killer whale (resident) | 0.07 | 0 | 0.00% | 15.61 | 20 | 0.85% |
| Killer whale (transient | 0.07 | 0 | 0.00% | 15.61 | 20 | 3.41% |
| Beluga whale (NMFS) | 0.06 | 0 | 0.00% | 27.40 | 35 | 10.67% |
| Beluga whale (Goetz) | 0.02 | 0 | 0.00% | 33.71 | 35 | 10.67% |
| Dall's porpoise | 1.32 | 1 | 0.00% | 7.58 | 10 | 0.01% |
| Harbor porpoise | 37.67 | 38 | 0.12% | 216.23 | 216 | 0.70% |
| Harbor seal | 288.07 | 288 | 1.05% | 11,496.15 | 6,847 | 25.00% |
| Steller sea lion | 0.70 | 1 | 0.00% | 374.85 | 375 | 0.74% |
| California sea lion | 0 | 0 | 0.00% | 0.00 | 5 | 0.00% |

#### 4.1.4. Impacts on Subsistence

Under the Alternative 1 (the Preferred Alternative), Hilcorp's oil and gas activities in in Cook Inlet are not expected to affect subsistence uses of wildlife and marine mammals in the area because subsistence use is limited to a small number of marine mammals and does not occur in the offshore region where much of the seismic work is proposed. The drilling activities, some of which may occur closer to shore, have smaller auditory zones of influence than seismic activity, meaning that the area in which marine mammals may be harassed surrounding drill rig activities are smaller, making harassment of marine mammals less likely. The background and additional information about subsistence users within or near Cook Inlet is summarized below.

The ADF&G conducted studies to document the harvest and use of wild resources by residents of communities on the east and west sides of Cook Inlet (Jones and Kostick 2016). Data on wild resource harvest and use were collected, including basic information about who, what, when, where, how, and how much wild resources are being used to develop fishing and hunting opportunities for Alaska residents. Tyonek was surveyed in 2013 (Jones et al., 2015), and Nanwalek, Port Graham, and Seldovia were surveyed in 2014 (Jones and Kostick 2016). Marine mammals were harvested by three (Seldovia, Nanwalek, Port Graham) of the four communities but at relatively low rates. The harvests consisted of harbor seals, Steller sea lions, and northern sea otters (*Enhydra lutris*).

**Table 6. Marine mammal harvest by Tyonek in 2013 and Nikiski, Port Graham, Seldovia, and Nanwalek in 2014**

| Village | Harvest (pounds per capita) | Households Attempting Harvest number (% of residents) | Number of Marine Mammals Harvested | | | |
|---|---|---|---|---|---|---|
| | | | Harbor Seal | Steller Sea Lion | Northern Sea Otter | Beluga Whale |
| Tyonek | 2 | 6 (6 %) | 6 | 0 | 0 | 0 |
| Seldovia | 1 | 2 (1 %) | 5 | 0 | 3 | 0 |
| Nanwalek | 11 | 17 (7 %) | 22 | 6 | 1 | 0 |
| Port Graham | 8 | 27 (18 %) | 16 | 1 | 24 | 0 |

In Tyonek, harbor seals were harvested between June and September by 6 percent of the households (Jones et al. 2015). Seals were harvested in several areas, encompassing an area stretching 20 miles along the Cook Inlet coastline from the McArthur River Flats north to the Beluga River. Seals were searched for or harvested in the Trading Bay areas as well as from the beach adjacent to Tyonek (Jones et al. 2015). In Seldovia, the harvest of harbor seals (5 total) occurred exclusively in December (Jones and Kostick 2016).
In Nanwalek, 22 harbor seals were harvested in 2014 between March and October, the majority of which occur in April. Nanwalek residents typically hunt harbor seals and Steller sea lions at Bear Cove, China Poot Bay, Tutka Bay, Seldovia Bay, Koyuktolik Bay, Port Chatam, in waters south of Yukon Island, and along the shorelines close to Nanwalek, all south of the Petition region (Jones and Kosick 2016).

According to the results presented in Jones and Kostick (2016) in Port Graham, harbor seals were the most frequently used marine mammal; Tribal members harvest 16 in the survey year. Harbor seals were harvested in January, February, July, August, September, November, and December. Steller sea lions were used noticeably less (1 animal harvested) and harvested in November and December.

The Cook Inlet beluga whale has traditionally been hunted by Alaska Natives for subsistence purposes. For several decades prior to the 1980s, the Native Village of Tyonek residents were the primary subsistence hunters of Cook Inlet beluga whales. During the 1980s and 1990s, Alaska Natives from villages in the western, northwestern, and North Slope regions of Alaska either moved to or visited the south-central region and participated in the yearly subsistence harvest (Stanek 1994). From 1994 to 1998, NMFS estimated 65 whales per year were taken in this harvest, including those successfully taken for food, and those struck and lost. NMFS has concluded that this number is high enough to account for the estimated 14 percent annual decline in population during this time (Hobbs et al. 2008). Actual mortality may have been higher, given the difficulty of estimating the number of whales struck and lost during the hunts. In 1999, a moratorium was enacted (Public Law 106-31) prohibiting the subsistence take of Cook Inlet beluga whales except through a cooperative agreement between NMFS and the affected Alaska Native organizations.

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on the Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a 5-year period (2008–2012), if the average abundance for the Cook Inlet beluga whales from the prior five years (2003–2007) is below 350 whales. The next 5-year period that could allow for a harvest (2013–2017), would require the previous five-year average (2008–2012) to be above 350 whales. Since the Cook Inlet beluga whale harvest was regulated in 1999 requiring cooperative agreements, five

beluga whales have been struck and harvested. Those beluga whales were harvested in 2001 (one animal), 2002 (one animal), 2003 (one animal), and 2005 (two animals). The Native Village of Tyonek agreed not to hunt or request a hunt in 2007, when no co-management agreement was to be signed (NMFS 2008).

The 2008 Cook Inlet Beluga Whale Subsistence Harvest Final Supplemental Environmental Impact Statement (NMFS 2008a) describes and informed NMFS determinations regarding how many beluga whales can be taken during a 5- year interval based on the 5-year population estimates and 10-year measure of the population growth rate. Based on the 2008– 2012 5-year abundance estimates, no hunt occurred between 2008 and 2012 (NMFS 2008a). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. No harvest occurred in the 2013-2017 five year management period. No harvest has occurred since then and no harvest is likely in 2019 or the next few years as the 10 year measure for required population growth is unlikely to be met.

Residents of the Native Village of Tyonek are the primary subsistence users in Knik Arm area (73 FR 60976). No households hunted beluga whale locally in Cook Inlet due to conservation concerns (Jones et al. 2015). The proposed project should not have any effect because no beluga harvest has taken place since 2005 and beluga hunts are not expected during the next five year period.

In summary, NMFS anticipates that any effects from Hilcorp's proposed activities on marine mammals, would be short-term, site specific, and limited to inconsequential changes in behavior. NMFS does not anticipate authorized taking of affected species or stocks would reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (1) Causing the marine mammals to abandon or avoid hunting areas; (2) directly displacing subsistence users; or (3) placing physical barriers between the marine mammals and the subsistence hunters; and that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

## 4.2. Effects of Alternative 2 – No Action Alternative

Where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis." (CEQ, Forty Questions, 3.A). NMFS' view is that it is likely that the applicant would choose to undertake its action in compliance with the law rather than proceed without the take authorization. Under the No Action Alternative, NMFS would not issue the rule to Hilcorp authorizing take of marine mammals. As a result, the exceptions to the prohibition on take of marine mammals per the MMPA would not apply and Hilcorp would not conduct the oil and gas activities as described in the application. There would be no direct or indirect impacts to marine mammals or their habitat resulting from no action. The marine mammal species and their habitat conditions would remain substantially similar to the condition described in Chapter 3, "Affected Environment".

## 4.3. Cumulative Effects

NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7). Cumulative impacts can result from individually minor but collectively significant actions that take place over of time.

For purposes of this analysis, the range of past, present, and reasonably foreseeable activities that result in cumulative impacts to marine mammal populations in the proposed project area include the following: subsistence hunting, marine pollution, fisheries interactions, vessel traffic; oil and gas development; coastal zone development, marine mammal research, and climate change.

### 4.3.1. Subsistence Hunting

In Cook Inlet, Native hunters historically have hunted beluga whales and harbor seals for food. The subsistence harvest of beluga transcends nutritional and economic value of the whale as the harvest is an integral part of the cultural identity of the region's Alaska Native communities. Inedible parts of the whale provide Native artisans with materials for cultural handicrafts, and the hunting perpetuates Native traditions by transmitting traditional skills and knowledge to younger generations. However, due to dramatic declines in the Cook Inlet beluga whale population, on May 21, 1999, legislation was passed to temporarily prohibit (until October 1, 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected ANOs (Public Law No. 106-31, section 3022, 113 Stat. 57,100). That prohibition was extended indefinitely on December 21, 2000 (Public Law No. 106-553, section 1(a)(2), 114 Stat. 2762). NMFS subsequently entered into six annual co-management agreements (2000-2003, 2005-2006) with the Cook Inlet Marine Mammal Council, an ANO representing Cook Inlet beluga hunters, which allowed for the harvest of 1-2 belugas annually.

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a 5-year interval period if the average stock abundance of Cook Inlet beluga whales over the prior five-year interval is below 350 whales. Harvest levels for the current 5-year planning interval (2013-2017) are zero because the average stock abundance for the previous five-year period (2008-2012) was below 350 whales. Based on the average abundance over the 2002-2007 period, no hunt occurred between 2008 and 2012 (NMFS, 2008). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. Additional information on the Cook Inlet beluga harvest can be found in NMFS (2008a).

There is a low level of subsistence hunting for harbor seals in Cook Inlet. Seal hunting occurs opportunistically among Alaska Natives who may be fishing or travelling in the upper Inlet near the mouths of the Susitna River, Beluga River, and Little Susitna. Some detailed information on the subsistence harvest of harbor seals is available from past studies conducted by the Alaska Department of Fish & Game (Wolfe et al., 2009). In 2008, 33 harbor seals were taken for harvest in the Upper Kenai-Cook Inlet area. In the same study, reports from hunters stated that harbor seal populations in the area were increasing (28.6%) or remaining stable (71.4%). The specific hunting regions identified were Anchorage, Homer, Kenai, and Tyonek, and hunting generally peaks in March, September, and November (Wolfe et al., 2009). The timing and location of subsistence harvest of Cook Inlet harbor seals would not coincide with active hunting and this subsistence hunt is conducted opportunistically and at low levels (NMFS, 2013c); therefore, no cumulative effects from subsistence hunting are anticipated.

### 4.3.2. Pollution

As the population in urban areas continue to grow, an increase in amount of pollutants that enter Cook Inlet is likely to occur. Sources of pollutants in urban areas include runoff from streets and discharge from wastewater treatment facilities. Gas, oil, and coastal zone development projects (*e.g.*, the Chuitna Coal Mine) also contribute to pollutants that enter Cook Inlet through discharge. Gas, oil, and coastal zone development will continue to take place in Cook Inlet; therefore, it would be expected that pollutants could increase in Cook Inlet. However, the EPA and the ADEC will continue to regulate the amount of pollutants that enter Cook Inlet from point and non-point sources through NPDES permits. As a result, permittees will be required to renew their permits, verify they meet permit standards and potentially upgrade facilities. Additionally, the extreme tides and strong currents in Cook Inlet may contribute in reducing the amount of pollutants found in the Inlet.

#### 4.3.3. Fisheries Interaction

Fishing is a major industry in Alaska. As long as fish stocks are sustainable, subsistence, personal use, recreational and commercial fishing will continue to take place in Cook Inlet. However, NMFS and the ADF&G manages fish stocks and monitors and regulates fishing in Cook Inlet to maintain sustainable stocks, resulting in no significant decline of prey availability due to fishing.

#### 4.3.4. Vessel Traffic

Major contributors to vessel traffic throughout Cook Inlet include port facilities, oil and gas development, and commercial and recreational fishing. The Port of Anchorage (POA) is a major Alaskan port located adjacent to Anchorage in upper Cook Inlet. The POA provides 90 percent of the consumer goods for 85 percent of the state of Alaska. The POA handles the majority of Alaska's refined petroleum products and the bulk of jet fuel for Joint Base Elmendorf-Richardson and the Ted Stevens Anchorage International Airport (100 and 60 percent respectively; POA, 2014). Major vessels calling to the POA include cargo ships, barges, tankers, dredgers, military ships and tug boats (POA, 2009). Based on data from 1998-2011, an average of approximately 450 vessels call to the POA annually (POA, 2014). The POA is outside the area Hilcorp is proposing to conduct oil and gas activities; however, the POA yields a high volume of vessels traffic that must pass through or near where oil and gas activities will take place. In addition, the POA is currently under construction and expanding its facilities. As a result, vessel traffic will increase once the project is complete.

Port MacKenzie is located in upper Cook Inlet and contributes to vessel traffic that passes through or near the area where oil and gas installation activities will take place. It receives about two large ships annually (i.e. a landing craft and/or a barge), which is substantially less than the POA. However, the number of ships calling to port at Port MacKenzie is expected to increase over the next five years; the Rail Extension and expanding the currently existing deep draft dock are planned for construction.

Other smaller port facilities that contribute to vessel traffic in the action area include Nikiski, the City of Kenai, Kasilof, Ninilchik, Anchor River, Tyonek and Drift River. Vessels ranging from tankers to fishing boats call to these ports (Kenai Peninsula Borough, 2003). Gas and oil development also contribute to vessel traffic in the action area, as well as commercial and recreational fishing vessels.

The proposed action is not within an active shipping lane and no pmajor changes to ports or vessel launch areas are expected. The project would increase small vessel presence and operation in the project area;

however, we have accounted for the impact of these vessels through the final rule and in this document as acoustic sources operating from vessels are the primary form of harassment for marine mammals considered. The project would not result in any long-term use of the area beyond the life of a drilledwell (e.g., it does not involve building a dock or port) and any vessel use in the future would be limited to rig maintenance and repair.

#### 4.3.5. Gas and Oil Development

Cook Inlet is estimated to have 500 million barrels of oil and over 19 trillion cubic feet of natural gas that are undiscovered and technically recoverable (Wiggin 2017). Schenk et al. (2015) determined that there may also be unconventional oil and gas accumulations in Cook Inlet of up to 637 billion cubic feet of gas and 9 million barrels of natural gas liquids. Unconventional oil and gas accumulations: (1) have Estimated Ultimate Recoveries (EUR) generally lower than conventional wells, (2) have low permeability and porosity, (3) require artificial stimulation for primary production, most commonly by hydraulic fracturing. (4) have only local to no migration of hydrocarbons (source rocks are reservoirs or in close proximity to reservoirs), (5) have no well-defined trap or seal, (6) have variable water production, (7) are generally not buoyant upon water, (8) have few truly dry holes, (9) have abnormal pressures, and (10) are regional in extent.

Lease sales for oil and gas development in Cook Inlet began in 1959 (Alaska Department of Natural Resources 2014). Prior to the lease sales, there were attempts at oil exploration along the west side of Cook Inlet. By the late 1960s, 14 offshore oil production facilities were installed in upper Cook Inlet, indicating that most of the Cook Inlet platforms and much of the associated infrastructure is over 40 years old. Today, there are 17 offshore oil and gas platforms in Cook Inlet. Figure 5 shows the ongoing oil and gas activities in state waters as of October 2018. Active oil and gas leases in Cook Inlet total 214 leases encompassing approximately 456,829 acres of State leased land of which 317,004 acres are offshore.

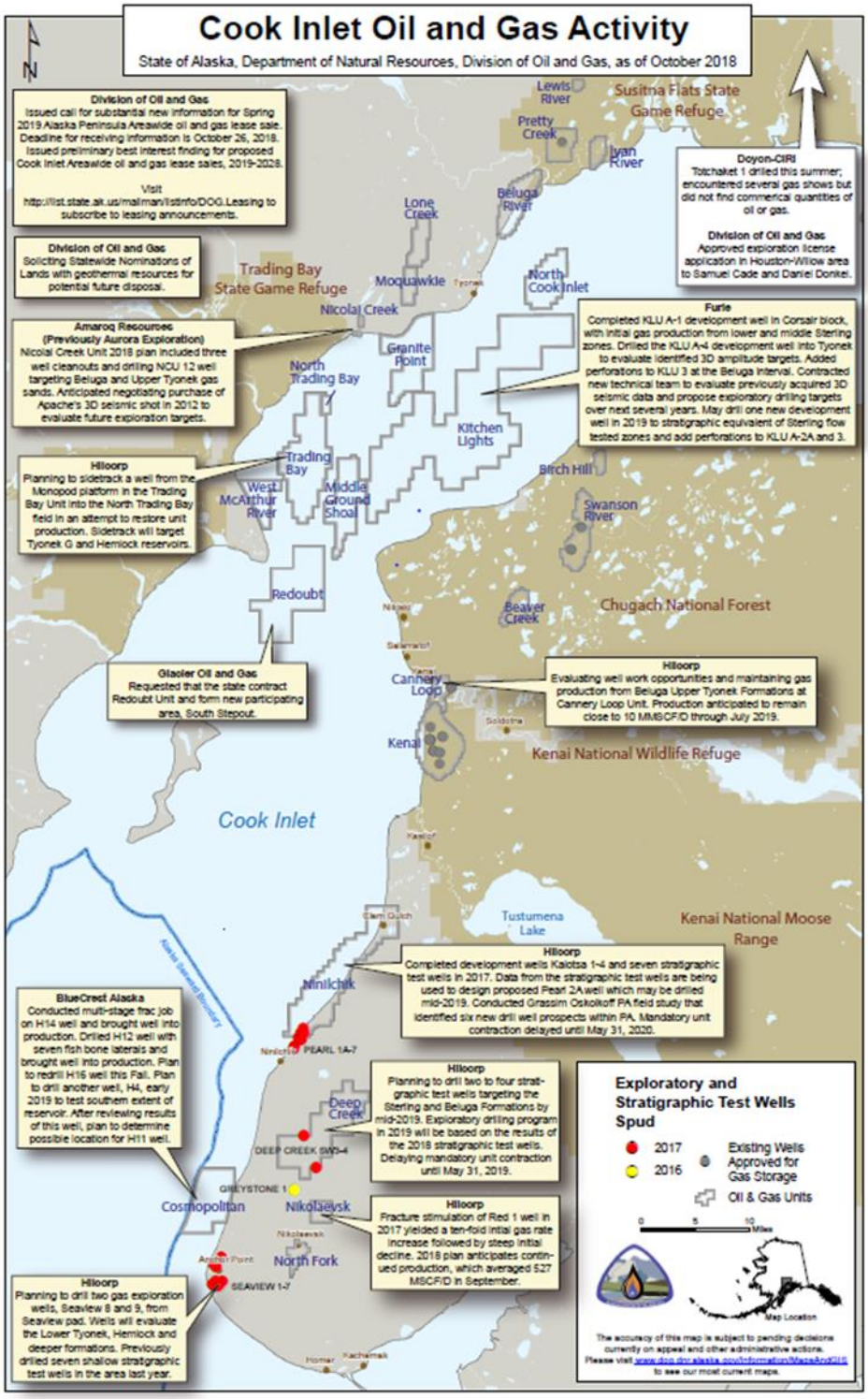



**Figure 5. Oil and gas activity in Cook Inlet as of October, 2018.**

In 2017, BOEM held Lease Sale #244 in Cook Inlet. Hilcorp was the only company responding, submitting bids on 14 of 224 tracts/Blocks offered; their successful bids encompass 31,005 acres. The proposed activities in these regulations will occur, in part, within these blocks.

Based on existing active leases and estimates of undeveloped oil and gas resources, oil and gas development will likely continue in Cook Inlet; however, the overall effects on marine mammals are unknown (NMFS 2008a, c). The Cook Inlet beluga Recovery Plan identified potential impacts from oil and gas development including increased noise from seismic activity, vessel traffic, air traffic, and drilling; discharge of wastewater and drilling muds; habitat loss from the construction of oil and gas facilities; and contaminated food sources and/or injury resulting from an oil spill or natural gas blowout (NMFS 2016a).

Other than Hilcorp, there are no other oil and gas exploration projects proposed in Cook Inlet that posess an MMPA authorization for incidental take and at the time of writing there are no additional applications being considered. In addition, Hilcorp would continue maintenance and repair work on existing pipelines and platforms; however, those activities are not believed to have the potential to harass marine mammals.

#### 4.3.6. Underwater Installations

Pipelines are an essential part of oil and gas activities in Cook Inlet. There are approximately 365 km (227 mi) of undersea pipelines in Cook Inlet, including 125 km (78 mi) of oil pipelines and 240 km (149 mi) of gas pipelines (Alaska Department of Natural Resources 2017). The possibility of pipeline failures are always associated with oil and gas development, with the associated possibility of oil spills, gas leaks, or other sources of marine petrochemical contamination.

##### Trans-Foreland Pipeline

In 2014, the Trans-Foreland Pipeline Co. LLC (owned by Tesoro Alaska) received approval from state, Federal, and regional agencies to build the Trans-Foreland Pipeline, a 46.7-km (29-mi) long, 20.3-cm (8-in) diameter oil pipeline from the west side of Cook Inlet to the Tesoro refinery at Nikiski and the Nikiski-Kenai Pipeline company tank farm on the east side of Cook Inlet. The pipeline will be used by multiple oil producers in western Cook Inlet, to replace oil transport by tanker from the Drift River Tank farm. Horizontal directional drilling (HDD) will be used at nearshore locations at the East and West Forelands to install the pipeline.

##### Hilcorp Cook Inlet Pipeline Cross Inlet Extension

In 2018, Hilcorp was issued an incidental harassment authorization (IHA) to Harvest Alaska, LLC (Harvest), associated with their plans to extend their existing undersea pipeline network to connect their Tyonek platform to the land-based Tyonek/Beluga, Alaska, pipeline at a point about 4 miles (6.4 km) north of the village of Tyonek. The IHA authorized Hilcorp to incidentally take, by Level B harassment, 40 Cook Inlet beluga whales, 6 Steller sea lions, and 5 humpback whales (NMFS 2018b).

##### Alaska LNG Project

The Alaska LNG (AK LNG) Project is being designed to carry natural gas from the North Slope to southcentral Alaska and for export internationally. Proposed infrastructure includes an 800-mile long, large diameter pipeline from the North Slope that would cross Cook Inlet north of the Forelands and terminate at a liquefaction facility proposed at the Nikiski area on the Kenai Peninsula. This project could eventually ship up to 2.4 billion cubic feet of liquefied natural gas (LNG) per day. The Alaska Gasline Development Corporation (AGDC) has applied for MMPA authorization for the Cook Inlet portion of the project, and the Federal Energy Regulatory Commission (FERC) is in the process of writing the Draft Environmental

Impact Assessment, with the final authorizations, including the MMPA permits and ESA consultation, expected in 2020.

The existing Kenai LNG liquefaction and terminal complex adjacent to the coast of Cook Inlet began operating in 1969. Until 2012, it was the only facility in the United States authorized to export LNG produced from domestic natural gas. With LNG shipments from the terminal declining, the terminal's owner announced in mid-2017 that it would put the plant in long-term shutdown, and the terminal has remained in warm-idle since 2015. In early 2019, however, the owners informed NMFS of their intention to bring the plant back into operation.

#### 4.3.7. Coastal Zone Development

Coastal zone development may result in the loss of habitat, increased vessel traffic, increased pollutants and increased noise associated with construction and noise associated with the activities of the projects after construction. In the action area, two main projects are being considered, the Chuitna Coal Mine and the Ocean Renewable Power Company (ORPC) Tidal Energy Project.

Pebble Mine Project

On October 5, 2018, NMFS received an application, pursuant to section 101(a)(5)(D) of the MMPA, from the Pebble Limited Partnership (PLP) requesting authorization to take, by Level B harassment, seven species of marine mammals in Cook Inlet. PLP is proposing to conduct geotechnical and geophysical surveys to support construction of a natural gas pipeline in lower Cook Inlet to supply energy to their proposed Pebble Mine project. Use of active acoustic equipment such as sub-bottom profilers and echosounders may incidentally harass marine mammals. The surveys would be conducted from Anchor Point on the each side of Cook Inlet to Amakdedori and Urses Cove on the western shoreline. The proposed surveys are planned to begin May 2019. NMFS is currently processing the application. Any potential issuance of an IHA would not authorize construction of the mine or any mining activities but rather would only authorize use of geotechnical equipment in a small portion of southwestern Cook Inlet. This activity would be spatially removed from Hilcorp's proposed activities and the effects of Pebble Mine's geotechnical activity would likely be lesser than those analyzed in the final rule for Hilcorp's oil and gas activities.

Chuitna Coal Project

PacRim Coal, LP is proposing to develop, construct and operate a coal mine and export facility 19 km (12 mi) northwest of the Village of Tyonek. Potential impacts to marine mammals in upper Cook Inlet from the Chuitna Coal Project would include the construction of the coal export facility and surface water discharge. The coal export facility that includes an overland coal conveyer and ship loading berth would extend from shore into Cook Inlet. The conveyer and ship berth would incorporate tower sites approximately 335 m (1,100 ft) apart to allow for uninhibited movement of marine life (PacRim Coal, LP, 2011). No chemical or water-based processing of the coal would take place; therefore, the expected sources of discharge from the project would include rainfall, snowmelt and groundwater (PacRim Coal,LP, 2011). Prior to discharging water into Cook Inlet, the water would be directed to sediment control structures and meet the water quality criteria described by the APDES permit (PacRim Coal, LP 2011).

ORPC Alaska Tidal Energy Projects

The ORPC is proposing two tidal energy projects in Cook Inlet. The first tidal energy project would be located on the Westside of Fire Island near Anchorage, and the second project would be located adjacent to the East Foreland in the vicinity of Nikiski on the Kenai Peninsula (ORPC, 2011). The tidal energy projects would require the installation of an array of turbine generator units and transmission cables on the seafloor to harness the tidal energy. The tidal energy will be converted to electrical energy at stations on land. These projects are still in preliminary testing and environmental monitoring phases (ORPC, 2011).

Any potential authorizations for these pipelines and activities do not overlap spatially with the Hilcorp's proposed oil and gas activities.

### 4.3.8. Marine Mammal Research

Because many important aspects of marine mammal biology remain unknown, or are incompletely studied, and because management of these species and stocks requires knowledge of their distribution, abundance, migration, population, ecology, physiology, genetics, behavior, and health, free-ranging marine mammal species are frequently targeted for scientific research and studies. Research activities normally include close approach by vessel and aircraft for line-transect surveys; behavioral observation; photo-identification and photo-video-grammetry; passive acoustic recording; attachment of scientific instruments (tagging), both by implantable and suction cup tags; biopsy sampling, including skin and blubber biopsy and swabbing; land-based surveys; live capture for health assessments, and blood and tissue sampling, pinniped tooth extraction, and related pinniped anesthesia procedures. All researchers are required to obtain a scientific research permit from NMFS Office of Protected Resources under the MMPA and/or ESA (if an ESA-listed species is involved). Currently, the permits authorizing research on beluga whales in Cook Inlet, as wells as permits authorizing research on harbor seals, harbor porpoises, Steller sea lions, and killer whales in Alaskan waters may have cumulative effects on these species and stocks but are likely not significant. NMFS anticipates that scientific research on marine mammals in Cook Inlet will continue, and possibly expand, due to the increasing need to better understand distribution and abundance relative to temporal (seasonal, diel, or tidal) and spatial (geographic or bathymetric) parameters.

### 4.3.9. Climate Change

The 2007 Intergovernmental Panel on Climate Change concluded that there is very strong evidence for global warming and associated weather changes and that humans have "very likely" contributed to the problem through burning fossil fuels and adding other "greenhouse gases" to the atmosphere (IPCC, 2007). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Evidence of climate change in the past few decades, commonly referred to as global warming, has accumulated from a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not

uniform and affect different areas in different ways and intensities. Arctic regions have experienced some of the largest changes, with major implications for the marine environment as well as for coastal communities. Recent assessments of climate change, conducted by international teams of scientists (Gitay et al., 2002 for the Intergovernmental Panel on Climate Change; (IPCC) Arctic Climate Impact Assessment, 2004; IPCC, 2007), have reached several conclusions of consequence for this EA:

- Average arctic temperatures increased at almost twice the global average rate in the last 100 years.
- Satellite data since 1978 show that perennial arctic sea ice extent has shrunk by 2.7 percent per decade, with larger decreases in sea ice extent in summer of 7.4 percent per decade.
- Arctic sea ice thickness has declined by about 40 percent during the late summer and early autumn in the last three decades of the $20^{th}$ century.

Marine mammals are classified as sentinel species because they are good indicators of environmental change. Arctic marine mammals are ideal indicator species for climate change, due to their circumpolar distribution and close association with ice formation. NMFS recognizes that warming of the Arctic, which results in the diminishing of ice, could be a cause for concern to marine mammals. In Cook Inlet, marine mammal distribution is dependent upon ice formation and prey availability, among other factors. For example, belugas often travel just along the ice pack and feed on prey beneath it (Richardson et al., 1991). Any loss of ice could result in prey distribution changes or loss; however, beluga whales do not use ice for resting, reproduction, or rearing of young like pinnipeds.

It is not clear how governments and individuals will respond or how much of these future efforts will reduce greenhouse gas emissions. Although the intensity of climate changes will depend on how quickly and deeply humanity responds, the models predict that the climate changes observed in the past 30 years will continue at the same or increasing rates for at least 20 years. Although NMFS recognizes that climate change is a concern for the sustainability of the entire ecosystem in Cook Inlet, it is unclear at this time the full extent to which climate change will affect marine mammal species.

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