UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802-1668

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Hilcorp Cook Inlet Tugs Towing a Jack-up Rig

NMFS Consultation Number: AKRO-2023-03574

Action Agency: National Marine Fisheries Service (NMFS), Office of Protected Resources, Permits and Conservation Division

Affected Species and Determinations:

ESA-Listed Species	Status	Is the Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Fin Whale (*Balaenoptera physalus*)	Endangered	Yes	N/A	No	N/A
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	No	No	No
Humpback Whale, Western North Pacific DPS (*Megaptera novaeangliae*)	Endangered	Yes	No	No	No
Cook Inlet Beluga Whale (*Delphinapterus leucas)*	Endangered	Yes	No	No	No
Steller Sea Lion, Western DPS (*Eumetopias jubatus)*	Endangered	Yes	No	No	No

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By: __________________________
Jonathan M. Kurland
Regional Administrator

Date: September 4, 2024

Accessibility of this Document

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TERMS AND ABBREVIATIONS

μPa	Micro Pascal
3D	Three-Dimensional
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADOT	Alaska Department of Transportation
AGL	Above Ground Level
AKR	Alaska Region
APDES	Alaska Pollution Discharge Elimination System
ARRC	Alaska Railroad Corporation
AWTF	Anchorage John M. Asplund Wastewater Treatment Facility
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
Cm	Centimeter
CO_2	Carbon Dioxide
CIPL	Cook Inlet Pipeline Cross-Inlet Extension
dB re 1μPa	Decibel referenced 1 microPascal
District Court	U.S. District Court for the District of Alaska
DPS	Distinct Population Segment
DQA	Data Quality Act
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ERF	Eagle River Flats
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
°F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plan
FR	Federal Register
Ft	Feet
Furie	Furie Operating Alaska
Hp	Horsepower
Hz	Hertz
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change

ITS	Incidental Take Statement
JASCO	JASCO Applied Sciences
JBER	Joint Base Elmendorf-Richardson
kHz	Kilohertz
Km	Kilometers
Kts	Knots
LNG	Liquefied natural gas
M	Meter
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
MP	Milepost
MWMT	Maximum weekly maximum temperature
μPa	Micro Pascal
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
OCS	Outer Continental Shelf
ORPC	Ocean Renewable Power Company
OSK	Offshore Systems Kenai
Pa	Pascals
PAH	Polycyclic aromatic hydrocarbons
PAMP	Port of Anchorage Modernization Program
PBF	Physical or biological feature
PCB	Polychlorinated biphenyls
PCE	Primary constituent elements
PCT	Petroleum and Cement Terminal
PDO	Pacific Decadal Oscillation
PK	Peak sound level
POA	Don Young Port of Alaska
Ppm	Parts per million
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
RMS	Root Mean Square
RPA	Reasonable and Prudent Alternative
SEL	Sound Exposure Level
SFD	South Floating Dock

SPL	Sound Pressure Level
SSV	Sound Source Verification
SUDEX	Susitna Delta Exclusion Zone
TL	Transmission Loss
TS	Threshold Shift
TTS	Temporary Threshold Shift
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Services
WNP	Western North Pacific

1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. § 1536(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 critical habitat of such species. When a Federal agency's action "may affect" a protected species, that agency is required to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14(a)). Federal agencies may fulfill this general requirement informally if they conclude that an action may affect, but "is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and NMFS or the USFWS concurs with that conclusion (50 CFR § 402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions to implement those measures.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 FR 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to NMFS' existing practice in implementing section 7(a)(2) of the Act. (84 FR at 45015; 89 FR at 24268). We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

In this document, the action agency is the NMFS Office of Protected Resources, Permits and Conservation Division (hereafter referred to as Permits Division), which proposes to issue an incidental harassment authorization (IHA) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. § 1361 et seq.), to Hilcorp Alaska, LLC (Hilcorp, the Applicant) for harassment of marine mammals incidental to the proposed action of tugs towing, holding, and positioning a jack-up rig. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's biological opinion (opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat.

The opinion and ITS were prepared by NMFS Alaska Region in accordance with section 7(b) of the ESA (16 U.S.C. § 1536(b)), and implementing regulations at 50 CFR part 402.

The opinion and ITS are in compliance with the Data Quality Act (44 U.S.C. § 3504(d)(1)) and underwent pre-dissemination review.

1.1 Background

This opinion is based on information provided in the IHA application and the proposed IHA (89 FR 60164, July 24, 2024). Other sources of information relied upon include consultation communications (emails and virtual meetings), recent consultations completed in the same region, previous monitoring reports, and marine mammal surveys conducted in Cook Inlet. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

The proposed action will occur in middle Cook Inlet and Trading Bay, extending north from Rig Tenders Dock on the eastern side of Cook Inlet near Nikiski to an area approximately 32 kilometers (km) south of Point Possession, west to the Tyonek platform in middle Cook Inlet, south to the Dolly Varden platform in Trading Bay, and back across Cook Inlet to the Rig Tenders Dock (Figure 1).

This opinion considers the effects of tugs towing, holding, and positioning a jack-up rig, production drilling, vessel support operations, and aircraft support operations on the endangered fin whale (*Balaenoptera physalus*), threatened Mexico distinct population segment (DPS) humpback whale (*Megaptera novaeangliae*), endangered Western North Pacific (WNP) DPS humpback whale, endangered Cook Inlet beluga whale (*Delphinapterus leucas*), endangered Western DPS Steller sea lion (*Eumetopias jubatus*), and Cook Inlet beluga whale critical habitat. There is no critical habitat for Mexico or WNP DPS humpback whales or Steller sea lions in the action area. The nearest critical habitat for the Mexico and WNP DPS humpback whale is located over 100 km from the action area (86 FR 21082, April 21, 2021), as is the nearest Steller sea lion critical habitat (58 FR 45269, August 27, 1993). The action area is considered outside of the range of the proposed for listing Sunflower sea star (*Pycnopodia helianthoides*). No critical habitat has been designated for the fin whale.

Figure 1. Geographic region of proposed activities.

1.2 Consultation History

- August 2, 2023 – NMFS AKR received the MMPA IHA application from Hilcorp
- September 11, 2023 – Hilcorp notified NMFS AKR that certain proposed activities in the initial IHA application would be removed
- September 19, 2023 – Hilcorp notified NMFS AKR that additional proposed activities in the initial IHA application would be removed
- September 29, 2023 – Hilcorp submitted a revised IHA application
- October 26, 2023 – NMFS Permits Division emailed questions and comments from both NMFS Permits Division and NMFS AKR on the revised September IHA application
- November 17, 2023 – NMFS Permits Division emailed additional questions on the revised September IHA application
- December 8, 2023 – NMFS AKR and NMFS Permits Division met with Hilcorp to discuss questions on the revised September IHA application
- December 27, 2023 – Hilcorp submitted another revised IHA application
- January 22, 2024 – NMFS AKR and NMFS Permits Division met with Hilcorp to discuss the revised December IHA application
- February 2, 2024 – NMFS Permits Division emailed questions and comments from both NMFS Permits Division and NMFS AKR on the revised December IHA application
- February 14, 2024 – Early Review Team (ERT), with participants from the NMFS Permits Division and NMFS AKR, met to discuss the project
- February 15, 2024 – NMFS Permits Division emailed questions and comments from both NMFS Permits Division and NMFS AKR resulting from the ERT meeting
- February 28, 2024 – Hilcorp submitted a revised IHA application
- March 13, 2024 – NMFS AKR received additional information specific to the biological opinion from Hilcorp
- March 14, 2024 – NMFS Permits Division emailed questions and comments from both NMFS Permits Division and NMFS AKR on the revised February IHA application
- March 24, 2024 – NMFS AKR emailed questions on the additional information provided that was specific to the biological opinion to Hilcorp
- March 26, 2024 – NMFS AKR and NMFS Permits Division met with Hilcorp to discuss questions on the revised February IHA application
- March 28, 2024 – Hilcorp provided answers to NMFS AKR questions on the additional information specific to the biological opinion
- April 8, 2024 – Hilcorp submitted a revised April IHA application
- April 12, 2024 – NMFS Permits Division determined the IHA application was adequate and complete
- July 18, 2024 – Request for consultation, draft IHA, and proposed Federal Register Notice (FRN) received by NMFS AKR from the NMFS Permits Division
- July 18, 2024 – NMFS AKR initiated consultation
- July 24, 2024 – Proposed IHA published in the Federal Register
- July 24, 2024 – NMFS AKR provided Hilcorp with a copy of the draft biological opinion
- August 12, 2024 – Hilcorp submitted comments on the draft opinion and, after review, NMFS AKR revised the opinion as warranted

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas (50 C.F.R. § 402.02).

The proposed action is issuance of an IHA to Hilcorp for harassment of marine mammals incidental to oil and gas activities in Cook Inlet. This opinion considers the effects of those oil and gas activities, specifically tugs towing, holding, and positioning a jack-up rig, production drilling, vessel support operations, and aircraft support operations. The action is expected to occur over 276 days between September 14, 2024, and September 13, 2025. During this time, the jack-up rig is expected to be moved three times over the course of six days: demobilization in 2024; one relocation between platforms between September 14, 2024, and September 13, 2025; and, mobilization in 2025. Hilcorp will be operating under an existing IHA and biological opinion during the preceding months of 2024 (87 FR 62364, October 14, 2022), which will be replaced if NMFS Permits Division issues the new IHA that is the subject of this consultation.

The proposed action is not expected to increase Hilcorp's future oil and gas production; Hilcorp will continue to operate in a manner similar to production operations prior to the proposed action. The project is not expected to increase aircraft, vessel, or other platform operations outside of the drilling season.

The following description of the proposed action derives primarily from the IHA application prepared by Hilcorp and the proposed IHA (89 FR 60164, July 24, 2024).

2.1.1 Proposed Activities

2.1.1.1 Offshore Production Drilling

Hilcorp plans to continue production drilling activities from existing platforms in middle Cook Inlet and Trading Bay. Hilcorp has been routinely conducting development drilling activities at offshore platforms to meet production needs. Development drilling activities occur from existing platforms within Cook Inlet through either well slots or existing wellbores in existing platform legs, and no well construction occurs during production drilling. On-platform production drilling will occur hundreds to thousands of feet below the seafloor.

All Hilcorp platforms in Cook Inlet have potential for development drilling activities. Platform drilling activities are accomplished by using conventional drilling equipment from a variety of rig configurations. Some platforms in Cook Inlet have permanent drilling rigs installed while others require the use of a mobile drill rig. Platforms with permanent drilling rigs operate using power provided by the platform power generation systems. Mobile drill rigs may also be powered by the platform power generation system (if compatible) or may use diesel-powered generators.

Rig generators run continuously during on-platform drilling operations and mud pumps may turn on and off several times a day, depending on drilling operations. Both produce sound; however, the transfer of sound into the water column is limited due to their location. Rig generators are located above the drill deck (the top-most deck of the platform), approximately 24 meters (m) to 43 m above mean high water. The drill deck provides for the external mobilization and placement of drilling rigs, equipment, and consumables onto the platform. The mud pumps are located on the jack-up rig.

Below the drill deck and above the supportive superstructure, there are multiple floors/levels of various permanently installed production and operations equipment that run constantly, including compressors, generators, turbines, and fluids handling and pumping systems. This production equipment on the permanent drilling rigs is greater in size and capacity, and is located closer to the water than the equipment on smaller mobile rigs.

2.1.1.1.1 Drilling Rig

Hilcorp proposes to conduct production drilling in middle Cook Inlet and Trading Bay using the Spartan 151 jack-up drill rig (or equivalent). A jack-up rig is a type of mobile offshore drill unit used in offshore oil and gas drilling activities. It is comprised of a buoyant mobile platform (hull) with adjustable legs that are used to raise and lower the hull over the surface of the water. The legs of the jack-up rig are designed to penetrate the seabed.

The Spartan 151 is a 150 H class independent-leg, cantilevered jack-up drill rig with a drilling depth capability of 7,620 m that can operate in maximum water depths up to 46 m. The dimensions of the Spartan 151 are hull length of 53 m, breadth of 49 m, and depth of 5.5 m, with legs that are 76 m in length.

To maintain safety and work efficiency, the Spartan 151 will be equipped with the following:

- either a 5,000-, 10,000-, or 15,000-pound-per-square-inch blowout preventer stack for drilling in higher pressure formations found at greater depths in Cook Inlet;
- sufficient variable deck load to accommodate the increased drilling loads, tubular frame for deeper drilling;
- reduced draft characteristics to enable the rig to easily access shallow water locations;
- riser tensioning system to adequately deal with the extreme tides and currents in up to 46 m water depth;
- steel hull designed according to United States Coast Guard (USCG) specifications (inspected by USCG prior to entering the water); and,
- ability to cantilever over existing platforms for working on development wells.

A jack-up rig is not self-propelled and tow vessels (tugs or heavy lift ships) are required for transport to offshore drilling locations. The Spartan 151 jack-up rig will be mobilized for production drilling from the Rig Tenders Dock in Nikiski and towed to an existing platform under the aforementioned 2023-2024 IHA in 2024. This biological opinion considers demobilization in 2024, one jack-up rig relocation between platforms between September 14, 2024, and September 13, 2025, and remobilization from the Rig Tenders Dock to middle Cook Inlet in 2025.

2.1.1.1.2 Ocean-going Tugs

The jack-up rig will be towed to each location by three ocean-going tugs, and a fourth tug may be used to position the jack-up rig on location. During towing activities, the most common configuration is two tugs positioned side by side (approximately 30 to 60 m) pulling from the front of the jack-up rig and one tug positioned behind the jack-up rig (approximately 200 m behind the front tugs) applying tension on the line as needed for steering and straightening. The tugs are attached to the jack-up rig by approximately 30 m of AmSteel-Blue rope. The lines are in the air and taut while the jack-up rig is under tow. The tugs will tow the jack-up rig at a speed of approximately four knots and will stay outside of shoreline areas and river mouths during transit. While positioning the jack-up rig, the tugs may be fanned out to provide finer control of movement. A fourth tug will be on standby to provide assistance during positioning, but this assistance is not expected to extend beyond one hour. The horsepower (hp) of each of the tugs may range between 4,000 and 8,000, and additional details about the proposed tugs are provided in Table 1. If the listed tugs are unavailable, tugs of similar size and power will be contracted.

Table 1. Description of tugs used for towing, holding, and positioning the jack-up rig.

Vessel Name	Primary Activity	Specifications
Bering Wind	Towing, holding, and positioning the jack-up rig	22 m length by 10 m breadth 144 gross tonnage
Stellar Wind	Towing, holding, and positioning the jack-up rig	32 m length by 11 m breadth 160 gross tonnage
Glacial Wind	Towing, holding, and positioning the jack-up rig	37 m length by 11 m breadth 196 gross tonnage
Dr. Hank Kaplan	Standby tug used only for positioning the jack-up rig, if needed	23 m length by 11 m breadth 176 gross tonnage

The amount of time the tugs are towing, holding, or positioning the jack-up rig is tide-dependent. The amount of operational effort (e.g., power output) required by the tugs during transit depends on whether the tugs are towing with or against the tide, and can vary across a tide cycle as the current speed increases or decreases over time. Hilcorp plans to maximize transit with the tide (which requires lower power output) and minimize transit against the tide (which requires higher power output). The variability in power output from the tugs under load with the jack-up rig can range from an estimated 20 to 90 percent. For example, power output may be greater than 50 percent for small periods of time (minutes) to counteract the tide during positioning (up to 90% power output). The majority of operations (towing, holding, and positioning), however, will occur at half power or less.

When mobilizing or demobilizing at the Rig Tenders Dock, a high slack tide is necessary for the tugs to be able to approach close enough to the shore. A high slack tide is also preferred to position the jack-up rig on an existing platform or well site. The relatively slow current and calm conditions at a slack tide enable the tugs to perform the fine movements necessary to safely position the jack-up rig within several feet of the platform. Pinning the legs down onto the seafloor during high slack tide also ensures the legs are an adequate height and the hull will remain above the water level of the subsequent incoming high tide.

Twelve hours elapse between each high slack tide and the tugs are generally under load for those 12 hours, as high slack tides are preferred to both attach and detach the jack-up rig from the tugs.

Once the tugs and jack-up rig are on location during high slack tide (12 hours from departure), there is a one to two hour window when the tide is slow enough (1 to 2 knots) for positioning the jack-up rig and pinning the legs to the sea floor. The tugs are estimated to be under load, generally at half-power effort or less, for up to 14 hours from the time of departure through the initial positioning attempt of the jack-up rig. An additional fourth tug may engage at half power for up to one hour during positioning activities in order to assist with the fine movements necessary to place the jack-up rig.

If the first positioning attempt takes longer than anticipated, the increasing current speed will prevent the tugs from safely positioning the jack-up rig on location. The jack-up rig will be temporarily pinned at a nearby location and the tugs will detach and generally float with the current in close proximity. Approximately one hour before the next high slack tide, the tugs will re-attach and reattempt positioning the jack-up rig over a period of two to three hours. The tugs will be under load holding or positioning the jack-up rig for up to five hours on the second day during the second positioning attempt. The jack-up rig is typically positioned over the platform after one or two attempts.

2.1.1.1.3 Vessel Support Operations

Major supplies will be staged on-shore at the Offshore Systems Kenai (OSK) Dock in Nikiski. Supplies and equipment will be transported to the platforms by vessels that are currently in use supporting offshore operations within Cook Inlet. These vessels will carry fuel, drilling water, mud materials, drilling tools, cement, casing, and well service equipment. The vessels will be outfitted with fire-fighting systems following fire prevention and control protocols.

Offshore drilling support vessels generally measure 47 to 64 m in length. The hulls are reinforced with steel construction, making them capable of operating in extreme conditions. Supply vessels are capable of moving personnel and cargo when severe weather will not allow helicopter flights. These vessels typically travel at seven knots and cannot exceed nine knots, due to cooling system constraints. Supply vessels do not use dynamic positioning but may rely on bow thrusters for close-quarter maneuvering due to safety concerns in unfavorable sea states. When performing docking maneuvers in unfavorable sea states, the bow thrusters are expected to be engaged for 20-30 seconds. In general, supply runs are conducted during periods of ideal tides and weather.

During jack-up rig mobilization and demobilization, one support vessel will be used continuously for approximately 30 days to facilitate moving rig equipment and materials. When the rig is being set up on location, approximately five vessel trips are required to deliver equipment, mud products, drill pipe, and other tangibles necessary for drilling. These trips may occur any time of day for approximately five days. Vessel trips to and from the platform while drilling is occurring are expected to increase, on average, by two trips per day from normal platform operations.

A maximum of two weeks prior to the jack-up rig being pinned, a support vessel will travel to the location and perform a scan of the seafloor using multi-beam sonar to ensure the area is clear of debris that could impact the ability to pin the legs of the jack-up rig. The sonar may be used for up to two hours during slack tide for the platform-to-platform rig move. The multi-beam sonar operates at a frequency outside of marine mammal hearing range and is not addressed further in our analysis.

2.1.1.1.4 Aircraft Support Operations

Aircraft support will be managed through existing offshore services based at the OSK heliport. The helicopters will deliver supplies and transport personnel to the production sites. While drilling occurs, helicopter flights are expected to increase (on average) by two flights per day from normal platform operations. Flights will follow a direct route at an altitude of 457 m or higher, unless human safety is at risk or it is operationally impossible (e.g., takeoff or landing points are so close together the aircraft cannot reach 457 m), to avoid acoustical harassment of marine mammals.

2.1.2 Mitigation Measures

General Mitigation Measures

1. Hilcorp will inform NMFS of impending in-water activities that require a protected species observer (PSO) a minimum of one week prior to the onset of those activities (email information to akr.prd.records@noaa.gov).
2. If project activities will occur outside of the time window specified in this opinion, the applicant will notify NMFS of the situation at least 60 days prior to the end of the specified time window to allow for reinitiation of consultation.
3. Consistent with AS 46.06.080, trash will be disposed of in accordance with state law. Hilcorp will ensure that all closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, Hilcorp will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.
4. Hilcorp will conduct briefings with the vessel crew and marine mammal monitoring team prior to the start of all in-water work (and when new personnel join) in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

PSO Requirements

5. At least one PSO will have either prior experience as a PSO in Alaska, or will have taken a NMFS-approved PSO or marine mammal observer training course.
6. PSO training will include:
    a. field identification of marine mammals and marine mammal behavior;
    b. ecological information on marine mammals and specifics on the ecology and management concerns of those marine mammals;
    c. ESA and MMPA regulations;
    d. proper equipment use;

   e. methodologies in marine mammal observation and data recording, and proper reporting protocols; and,
   f. an overview of PSO roles and responsibilities.

7. PSOs will be individuals independent from the project proponent and must have no other assigned tasks during monitoring periods.
8. Hilcorp will provide resumes or qualifications of PSO candidates to the consultation biologist and akr.prd.records@noaa.gov for approval at least one week prior to in-water work. NMFS will provide a brief explanation of lack of approval in instances where an individual is not approved.
9. PSOs will:
   a. be able to identify marine mammals and accurately record the date, time, and species, of all observed marine mammals in accordance with project protocols;
   b. be able to identify listed marine mammals that may occur in the action area and determine the marine mammal's location and distance from the sound source;
   c. have the ability to effectively communicate orally with project personnel to provide real-time information on listed marine mammals;
   d. possess a copy of the mitigation measures; and,
   e. possess data forms.
10. PSOs will not scan for marine mammals for more than four hours without at least a one hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

PSO Procedures

11. PSOs will monitor out to the greatest extent possible using the naked eye, reticle binoculars, and/or NMFS-approved night vision devices.
12. PSOs will be in communication with the appropriate operations personnel at all times in order to relay marine mammal sightings relative to the ongoing activity.
13. PSOs will have the ability, authority, and obligation to order appropriate mitigation response, including delay, to avoid takes of listed marine mammals.
14. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.

Tugs Towing the Jack-up Rig

15. PSOs will watch for marine mammals from the best available vantage point, ideally an elevated stable platform from which the PSO has an unobstructed 360-degree view of the water or a total 360-degree view between all PSOs on-watch.
16. Hilcorp will establish a clearance zone that extends 1,500 m from the tug or jack-up rig and PSOs will be positioned such that they will collectively be able to monitor the entirety of the clearance zone.

17. During daylight hours (between sunrise and sunset), two PSOs will scan the clearance zone for 30 minutes immediately prior to commencing tugging or positioning work, and prior to re-starting work after any stoppage of 30 minutes or greater; if no marine mammals are observed within those 30 minutes, activities may commence.
18. During nighttime hours (between sunset and sunrise), two PSOs will scan the clearance zone to the greatest extent feasible using NMFS-approved night vision devices for 30 minutes prior to towing or positioning work, and prior to re-starting work after any stoppage of 30 minutes or greater. If no marine mammals are observed within those 30 minutes, activities may commence.
    a. Hilcorp will provide the NMFS consultation biologist or section 7 coordinator with the brand and model number of the proposed night vision device at least 30 days prior to the initiation of in-water activities that require a PSO. Hilcorp will not use unapproved devices, and in-water activities will not occur during nighttime hours without the use of NMFS-approved night vision devices.
19. If a non-beluga marine mammal is observed within the clearance zone during the pre-activity clearing period, tugging activities will be delayed until:
    a. the PSO observes the animal outside of and on a path away from the clearance zone; or,
    b. the PSO confirms that the animal has not been observed in the clearance zone for 30 minutes.
20. If a Cook Inlet beluga(s) is observed at any distance during the pre-activity clearing period, tugging activity will be delayed until the PSO confirms that the beluga(s) has not been observed for 30 minutes, unless the delay interferes with the safety of working conditions.
21. Two NMFS-approved PSOs will monitor during the entirety (day and night) of the jack-up rig towing, holding, and positioning operations from one of the tugs or the jack-up rig.
22. If a marine mammal is observed during towing or positioning of the jack-up rig, the PSOs will monitor and carefully record any reactions observed until the towing, holding, or positioning is concluded, or the animal is no longer observed. No new operational activities will be started until the animal leaves the clearance zone. Shifting from towing to positioning without shutting down is not considered a new operational activity.
23. Two PSOs will scan the clearance zone and surrounding waters for at least 30 minutes after each towing and positioning event, and after each stoppage of 30 minutes or greater.
24. For transportation of the jack-up rig to or from the Tyonek Platform, one PSO will be stationed on the Tyonek platform. This is in addition to the two PSOs monitoring on the jack-up rig during towing and positioning. The Tyonek PSO will monitor out to the maximum extent possible for an hour before the tugs are expected to arrive (scheduled to approach the Level B harassment threshold).
25. Hilcorp will conduct tugs towing, holding, and positioning the jack-up rig operations with a favorable tide (as explained in the proposed action) unless human safety or equipment integrity are at risk.

26. Hilcorp will only conduct tugging activities at night if necessary to take advantage of a favorable tide.
27. Project activity noise in excess of the 120 dB threshold will not occur between the shoreline and the mean lower low water (MLLW) line in the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and November 15.
    a. Project vessel(s) operating in or transiting through Cook Inlet will maintain a distance of at least 2.4 km south of the MLLW line.

Drilling

28. A PSO or crewmember will monitor waters within 330 m of the drilling location for 30 minutes prior to startup of the jack-up rig generators and mud pumps, as well as when drilling generators and mud pumps have ceased operating for a period of 30 minutes or longer. If one or more listed species are observed within 330 m, the activity will not begin until the listed species exits the 330 m zone of their own accord, or the 330 m zone has remained clear of listed species for 30 minutes immediately prior to commencement of the activity. The pre-in water activity observation period applies only when both the mud pumps and generators are shut off together for 30 minutes or longer.

Support Aircraft

29. Except during takeoff, landing, and in emergency situations, all aircraft will transit at an altitude of at least 457 m while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 457 m, aircraft will make course adjustments, as needed, to maintain at least a 457 m horizontal separation from all observed listed marine mammals.
30. All aircraft will remain at least 914 m from Steller sea lion haul outs and rookeries.
31. Aircraft will not hover or circle over listed marine mammals.

Support Vessels

32. Support and supply vessel operators will:
    a. maintain a watch for marine mammals at all times while underway;
    b. stay at least 91 m away from listed marine mammals,
    c. travel at less than 5 knots when within 274 m of a whale;
    d. avoid changes in direction and speed when within 274 m of a whale, unless doing so is necessary for maritime safety;
    e. not position vessel(s) in the path of a whale, and will not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);
    f. reduce vessel speed to 10 knots or less when weather conditions reduce visibility to 1.6 kilometers or less; and

g. adhere to the Alaska Humpback Whale Approach Regulations (see 50 CFR §§ 216.18, 223.214, and 224.103(b); these regulations apply to all humpback whales). Specifically, crew will not:
    i. approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 100 yards of any humpback whale;
    ii. cause a vessel or other object to approach within 100 yards of any humpback whale; or
    iii. disrupt the normal behavior or prior activity of a humpback whale by any other act or omission.

33. If a whale's course and speed are such that it will likely cross in front of a project vessel that is underway, or approach within 100 yards of the vessel, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel.
34. Vessels will not allow lines to remain in the water unless both ends are under tension and affixed to vessels or gear.
35. Project vessels operating in or transiting through Cook Inlet will maintain a distance of at least 2.4 km south of the mean lower low water (MLLW) line in the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and November 15.

<u>Data Collection</u>

36. PSOs will record observations on data forms or into electronic data sheets.
37. Hilcorp will ensure that PSO data will be submitted electronically to NMFS in a format that can be queried such as a spreadsheet or database (i.e., digital images of data sheets are not sufficient).
38. PSOs will record the following:
    a. project name, date, shift start time, shift stop time, and PSO identifier;
    b. date and time of each reportable event (e.g., a listed marine mammal observation, change in weather conditions);
    c. weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea state (https://www.weather.gov/mfl/beaufort);
    d. species, numbers, and, if possible, sex and age class of observed listed marine mammals;
    e. the predominant anthropogenic sound-producing activities occurring during each listed marine mammal observation;
    f. observations of listed marine mammal behaviors and reactions to anthropogenic sounds and presence;

g. geographic coordinates of initial, closest, and last location of listed species, including distance from observer to the listed species, and minimum distance from the predominant sound-producing activity to listed species; and,

h. whether the presence of a listed species necessitated the implementation of mitigation measures to avoid acoustic impact (i.e., delay), and the duration of time that normal operations were affected by the presence of listed species.

Reporting

Unauthorized Take

39. If a listed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal is injured or killed as a direct or indirect result of this action), the Hilcorp Wildlife Specialist will report the incident to NMFS (akr.prd.records@noaa.gov) within one business day. The record will include:

    a. all information to be provided in the final report in a digital, queryable document;
    b. the date, time, and location of each event (provide geographic coordinates);
    c. description of the event;
    d. number of individuals of each listed marine mammal species affected;
    e. mitigation measures implemented prior to and after the animal was taken;
    f. the contact information for the PSO on duty or the contact information for the individual piloting, if a vessel struck a listed marine mammal; and,
    g. photographs or video footage of the animal(s) (if available).

Stranded, Injured, Sick, or Dead Marine Mammal

40. If PSOs observe an injured, sick, or dead marine mammal (i.e., stranded marine mammal), they will notify the Alaska Marine Mammal Stranding Hotline at 877-925-7773. The PSOs will submit photos and available data to aid NMFS in determining how to respond to the stranded animal. If possible, data submitted to NMFS in response to stranded marine mammals will include date/time, location of stranded marine mammal, species and number of stranded individuals, description of the stranded marine mammal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.

Illegal Activities

41. If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement at (Table 2; 1-800-853-1964).

42. Data submitted to NMFS will include date/time, location, description of the event, and any photos or videos taken.

Extralimital Sightings

43. All observations of ESA-listed marine mammal species not considered in this consultation will be reported to NMFS within 24 hours. Photographs and/or video should be taken, if possible, to aid in photo identification of individual animals. Reports will include all applicable information that would be included in a final report.

Monthly Reports

44. Hilcorp will submit interim monthly monitoring reports, including data sheets, for all months during which tugs towing, holding, and positioning the jack-up rig occurred. These reports will include a summary of marine mammal species and behavioral observations, delays, and work completed.
45. Monthly reports will be submitted to akr.prd.records@noaa.gov by the 15th day of the month following the reporting period. For example, the report for activities conducted in June 2025, will be submitted by July 15, 2025.

Final Report

46. A draft final report summarizing the data recorded will be submitted to NMFS at akr.prd.records@noaa.gov within 90 calendar days of the completion of the project. The report will summarize all in-water activities associated with the proposed action and results of PSO monitoring conducted during the in-water project activities. NMFS AKR will provide comments within 30 days after receiving this report, and Hilcorp must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report may be considered final.
47. The final report will contain the information described in the Marine Mammal Monitoring and Mitigation Plan and, at minimum, will include:
    a. summaries of monitoring efforts, including dates and times of operations, dates and times of monitoring, dates and times and duration of delays due to listed marine mammal presence;
    b. environmental conditions during monitoring periods, including Beaufort sea state, visibility, daylight/nighttime, and any other relevant weather conditions;
    c. dates and times of listed marine mammal observations, geographic coordinates of listed marine mammals at their closest approach to the project site, including date, species, age/size/sex (if determinable), and group sizes;
    d. number of listed marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);
    e. observed listed marine mammal behaviors and movement types versus project activity at the time of observation;
    f. activities occurring during each observation period, including:
        i. type of activity (e.g., towing or positioning, number of tugs in use);

ii. total duration of each type of activity;

iii. number of attempts required for positioning jack-up rig; and,

iv. when nighttime operations were required and if towing against the tide was required.

g. an evaluation of the effectiveness of the night vision devices, including a general assessment of the distance PSOs can detect marine mammals in given environmental conditions (cloudy, full moon, etc.), the distance in which they can detect large whales and pinnipeds, which behaviors were visible through night vision devices (e.g., blows, body, splashing etc.), and any other conditions that influenced visibility and detection rates (e.g., NVD settings, weather, bridge lighting, ambient light, PSO location [inside or outside], etc.);

h. any photos or videos taken of marine mammals; and,

i. digital, queryable documents containing PSO observations and records, and digital, queryable reports.

Table 2. Summary of agency contact information

Reason for Contact	**Contact Information**
Consultation Questions & Unauthorized Take	akr.prd.section7@noaa.gov
Reports & Data Submittal	akr.prd.records@noaa.gov
Stranded, Injured, or Dead Marine Mammals	Stranding Hotline (24/7 coverage) 1-877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802, AKRNMFSSpillResponse@noaa.gov
Illegal Activities *(not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)*	NMFS Office of Law Enforcement (AK Hotline): 1-800-853-1964
In the event that this contact information becomes obsolete	NMFS Anchorage Main Office: 907-271-5006 or NMFS Juneau Main Office: 907-586-7236

2.2 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.

NMFS defines the action area for this consultation to include the area within which project-related noise levels exceed 120 dB re 1 µPa root mean square (rms), and are expected to approach ambient noise levels (i.e., the point where no measurable effect from the project would occur). The use of four tugs to position the jack-up rig produces the loudest sound source associated with this project, and the sound attenuates to 120 dB at approximately 4,453 m. When three tugs are used to tow or position the jack-up rig, sound attenuates to 120 dB at approximately 3,850 m. The action area includes: the path the three tugs and jack-up rig travel between platforms in 2024 or 2025, from the final platform to the Rig Tenders Dock in Nikiski during demobilization in 2024, and from the Rig Tenders Dock to the first platform during mobilization in 2025; the area surrounding the jack-up rig when three tugs are used for positioning at these locations; and, the area surrounding the jack-up rig when four tugs are used for positioning at these locations (Figure 2). See the Acoustic Threshold section for more information on the modeling and calculation of these isopleths. The action area also consists of Hilcorp's oil and gas activities, including production drilling, vessel support operations, and aircraft support operations in middle Cook Inlet and Trading Bay.

For the purposes of this project, lower Cook Inlet refers to waters south of the East and West Forelands; middle Cook Inlet refers to waters north of the East and West Forelands and south of Threemile River on the west and Point Possession on the east; Trading Bay (which is part of middle Cook Inlet) refers to waters from approximately the Granite Point Tank Farm on the north to the West Foreland on the south; and, upper Cook Inlet refers to waters north and east of Beluga River on the west and Point Possession on the east.

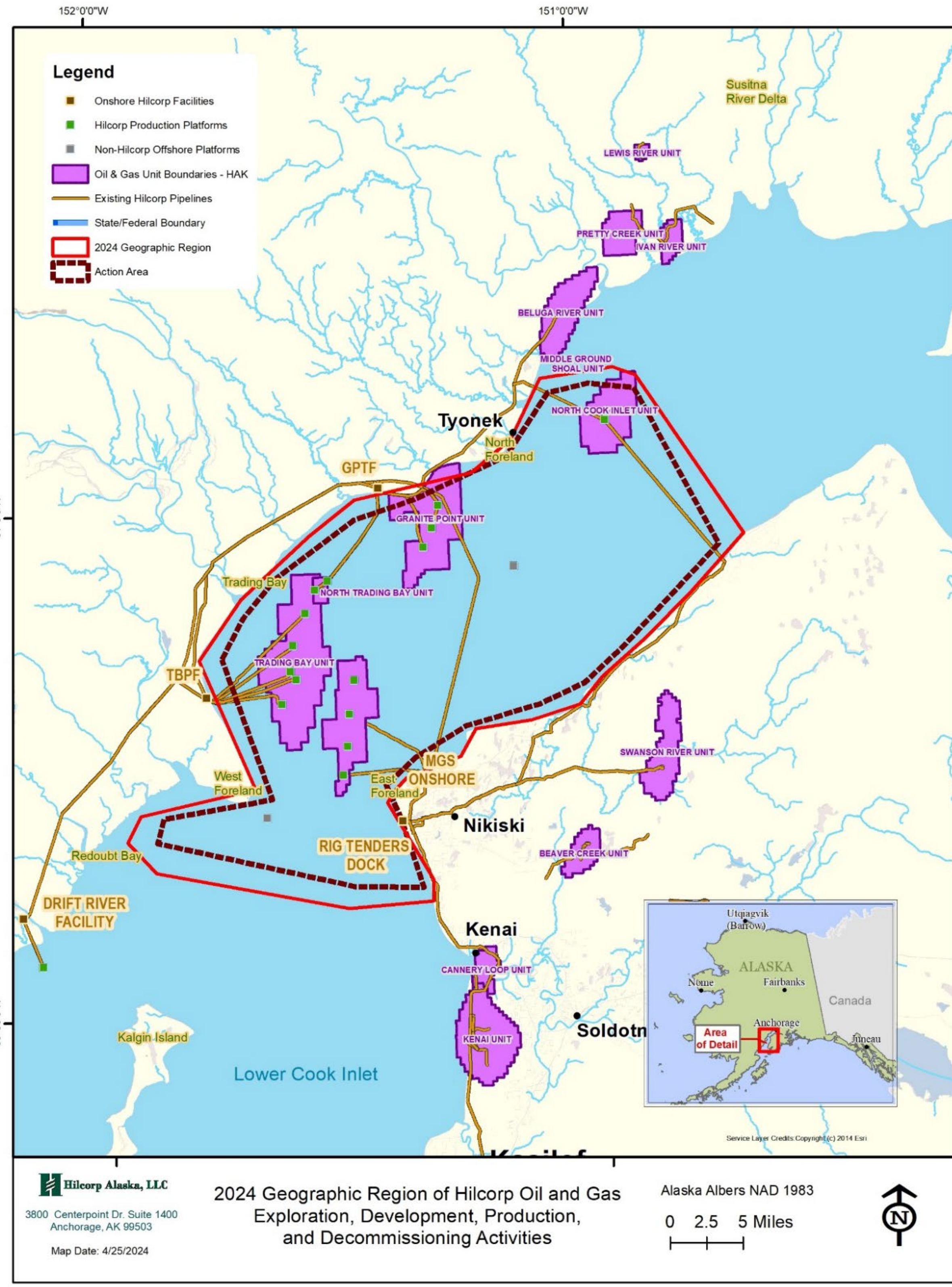

Figure 2. Project action area.

3 APPROACH TO THE ASSESSMENT

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

To jeopardize the continued existence of a listed species means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02). As NMFS explained when it promulgated this definition, NMFS considers the likely impacts to a species' survival as well as likely impacts to its recovery. Further, it is possible that in certain, exceptional circumstances, injury to recovery alone may result in a jeopardy biological opinion (51 FR 19926, 19934; June 3, 1986).

Under NMFS's regulations, the destruction or adverse modification of critical habitat means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR § 402.02).

The designation(s) of critical habitat for Cook Inlet beluga whales use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (81 FR 7414; February 11, 2016) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, our use of the term PBF also applies to Primary Constituent Elements and essential features.

We use the following approach to determine whether the proposed action described in Section 2 of this opinion is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these effects.

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.

- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.

- Analyze the effects of the proposed action. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and sex of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat PBFs. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.

- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.

- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.

- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or, (2) appreciably diminish the value of critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.

- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.

- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

Four species (five DPSs) of ESA-listed marine mammals under NMFS's jurisdiction may occur in the action area. Designated critical habitat for the Cook Inlet beluga whale also occurs in the action area. This opinion considers the effects of the proposed action on the species and designated critical habitats specified in Table 3. The nearest designated critical habitat for the Mexico and WNP DPS of humpback whale is over 100 km from the action area, as is the nearest critical habitat for the Steller sea lion.

Table 3. Listing status and critical habitat designation for species considered in this opinion.

Species	Status	Listing	Critical Habitat
Fin Whale (*Balaneoptera physalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Humpback Whale, Mexico DPS *(Megaptera novaeangliae)*	Threatened	NMFS 2016, 81 FR 62260	NMFS 2021 86 FR 21082
Humpback Whale, Western North Pacific DPS *(Megaptera novaeangliae)*	Endangered	NMFS 2016, 81 FR 62260	NMFS 2021 86 FR 21082
Cook Inlet beluga whale (*Delphinapterus leucas*)	Endangered	NMFS 2008, 73 FR 62919	NMFS 2011, 76 FR 20180
Steller Sea Lion, Western DPS *(Eumetopias jubatus)*	Endangered	NMFS 1997, 62 FR 24345	NMFS 1993, 58 FR 45269

4.1 Species and Critical Habitat Not Likely to be Adversely Affected by the Action

NMFS uses two criteria to identify those endangered or threatened species or critical habitat that are likely to be adversely affected by the proposed action. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with the proposed action and a listed species or designated critical habitat. The second criterion is an assessment of the potential response given exposure. We applied these criteria to the species and critical habitats listed above. Cook Inlet beluga whale critical habitat will be exposed to stressors from the proposed project but is not likely to be adversely affected.

4.1.1 Cook Inlet Beluga Whale Critical Habitat

On April 11, 2011, NMFS published a final rule to designate critical habitat for the Cook Inlet beluga whale (Figure 3; 76 FR 20180). The critical habitat is defined by two areas that together encompass 7,800 km^2 of marine and estuarine habitat in Cook Inlet. For national security reasons, critical habitat excludes all property and waters of Joint Base Elmendorf-Richardson (JBER) and waters adjacent to the Port of Alaska.

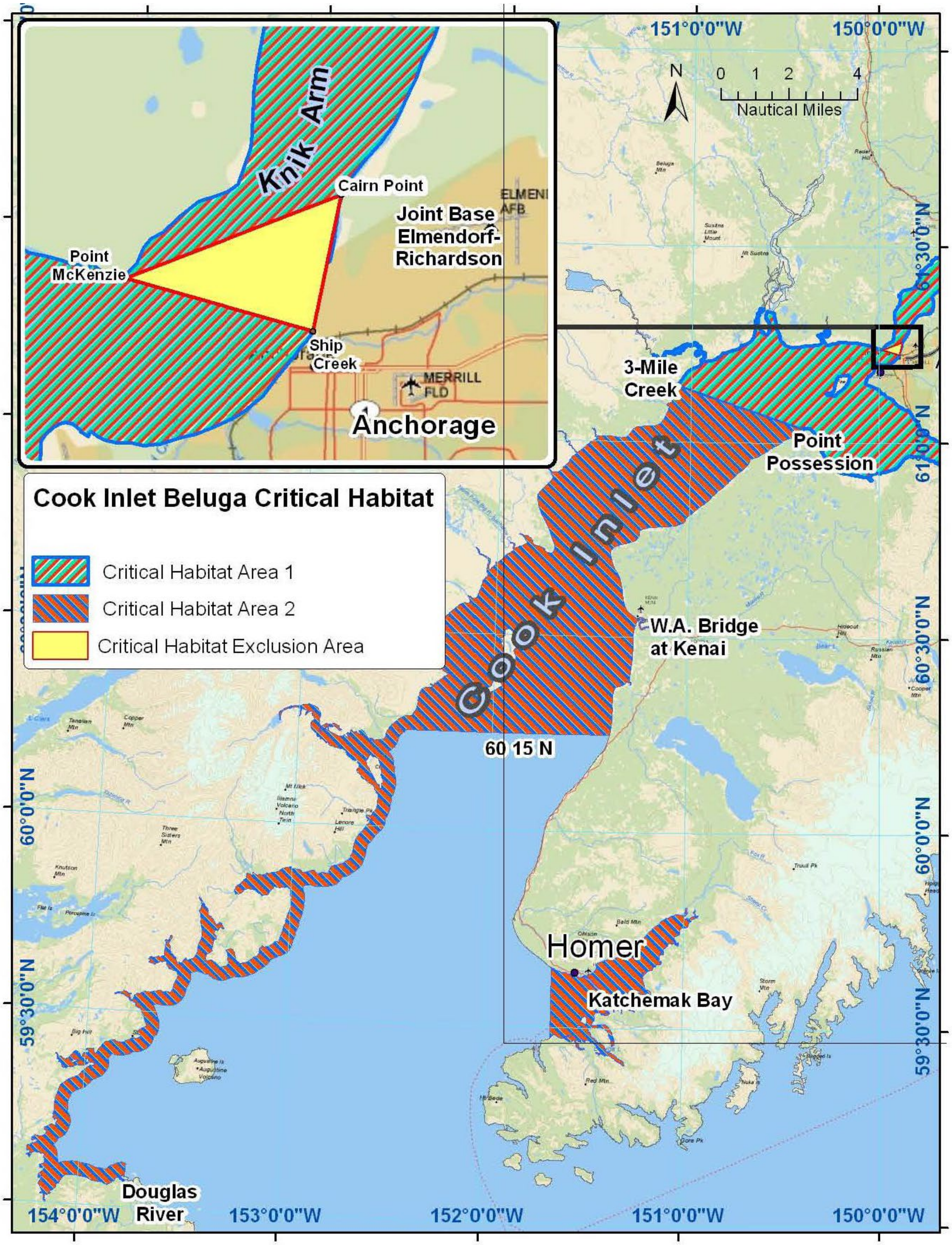

Figure 3. Designated Cook Inlet beluga whale critical habitat.

Critical habitat Area 1 encompasses 1,909 km^2 of Cook Inlet northeast of a line from the mouth of Threemile Creek to Point Possession. This area is bounded by the Municipality of Anchorage, the Matanuska-Susitna Borough, and the Kenai Peninsula Borough. The area contains shallow tidal flats and river mouths or estuarine areas, and it is important foraging and calving habitat. Mudflats and shallow areas adjacent to medium and high flow accumulation streams may also provide other biological needs, such as molting or escape from predators (Shelden et al. 2003). Area 1 has the highest concentration of beluga whales from spring through fall, as well as the greatest potential for adverse impact from anthropogenic threats (76 FR 20180).

Critical habitat Area 2 is located south of Area 1, and includes both near and offshore waters of the mid and upper Inlet, and nearshore waters along the west side and Kachemak Bay on the east side of the lower Inlet. Area 2 consists of 5,891 km^2 of habitat with less concentrated beluga use in spring and summer, and known fall and winter use areas. Area 2 is largely based on dispersed fall and winter feeding and transit areas in waters where whales typically occur in smaller densities or deeper waters (76 FR 20180).

The Cook Inlet Beluga Whale Critical Habitat Final Rule included designation of five Primary Constituent Elements (PCEs), referred to as Physical and Biological Features (PBFs) in this opinion. The below five PBFs were deemed essential to the conservation of the Cook Inlet beluga whale (50 CFR § 226.220(c)):

1. Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within five miles of high and medium flow anadromous fish streams.
2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.
3. Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.
4. Unrestricted passage within or between the critical habitat areas.
5. Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.

The action area overlaps with critical habitat Area 2 (Figure 4). NMFS has identified noise from project activities, the possible accidental release of pollutants, and effects to prey as the stressors that may affect Cook Inlet beluga whale critical habitat. The potential effects of these stressors on the PBFs are discussed below.

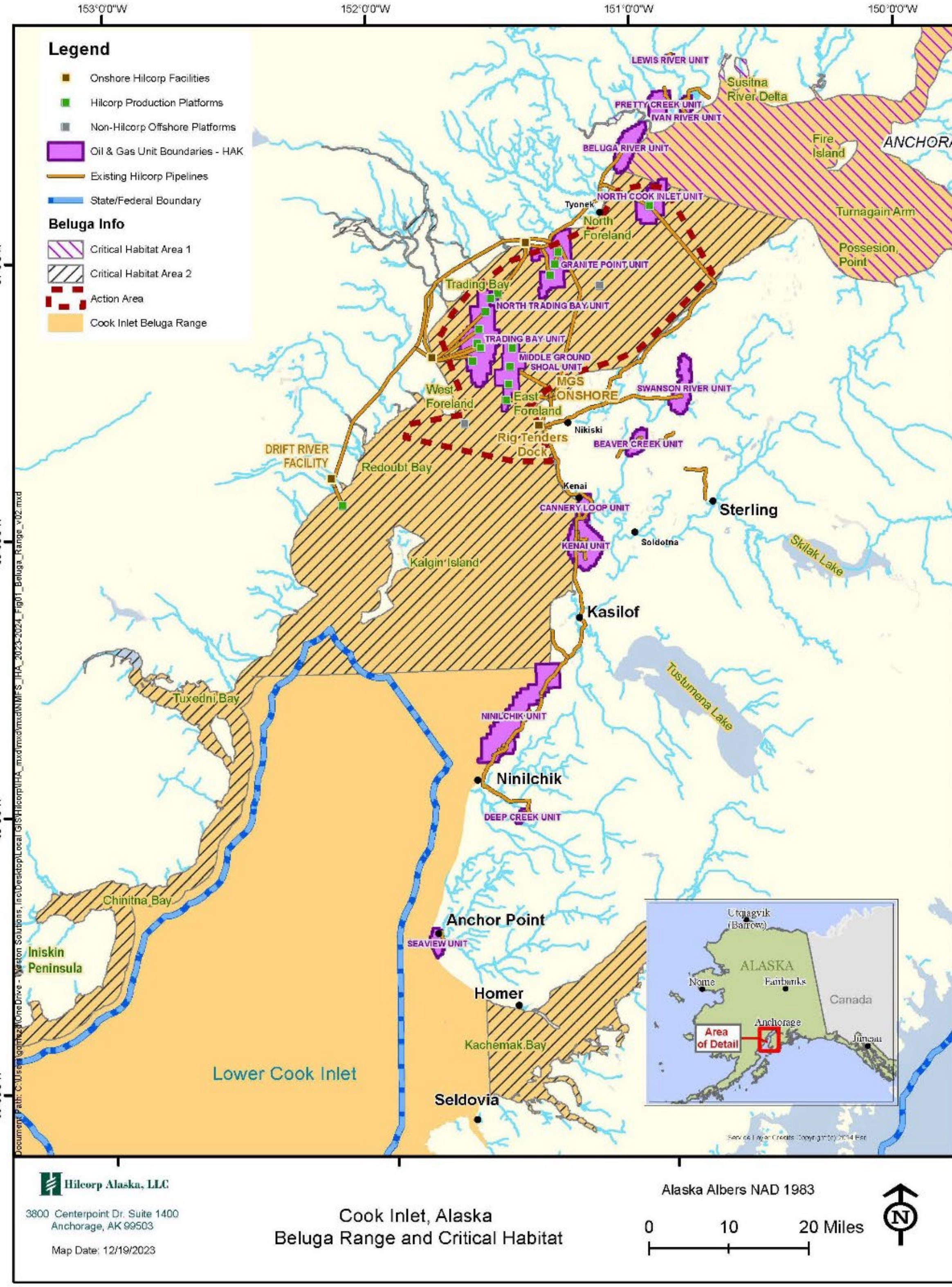

Figure 4. Action area and Cook Inlet beluga whale critical habitat.

PBF1: Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within five miles of high and medium flow anadromous fish streams.

The shallow water channels and mudflats at the mouths of anadromous streams are important to belugas because they concentrate prey into narrow channels and offer protection from killer whales. There are several anadromous streams and associated intertidal and subtidal waters that occur within, and in close proximity to, the action area. These waters could be affected by project sound, release of pollutants, and through direct effects on prey species.

Sound source levels may increase above 120 dB during tugging activities; however, this is expected to be temporary; tugs towing, holding, and positioning the jack-up rig will occur on six non-consecutive days over the course of a year. Additionally, the sound will be limited to the time needed for the tugs towing the jack-up rig to pass each stream and associated intertidal and subtidal waters, and not all of the anadromous streams in middle Cook Inlet will be passed in one day. Project activities will also not increase ambient noise above 120 dB at the MLLW at the Susitna Delta between April 15 and November 15, a primary foraging location and time for Cook Inlet beluga whales. The Tyonek platform is more than 10 km away from the MLLW near Beluga River and the largest acoustic threshold for project activities is 4,453 m when four tugs are positioning the rig for up to one hour. Three tugs towing, holding, and positioning the jack-up rig produces an acoustic threshold of 3,850 m.

The possibility of an oil spill and the resulting impacts to beluga prey is a concern for all Cook Inlet waters. Large spills are rare and unlikely to occur during the proposed action. Small spills rapidly disperse due to tide-induced turbulence and mixing. The probability of an oil spill adversely affecting anadromous streams and prey species is very small, and we expect no project-related measurable impact to beluga prey.

Direct effects on prey species from project activities is expected to be minor. A very small proportion of primary prey species may be temporarily disturbed from sound or non-acoustic sources of disturbance, with a geographic extent much smaller than the action area.

The probability of the proposed activities adversely affecting anadromous streams is very small, and adverse effects to PBF1 are expected to be minor and undetectable.

PBF 2: Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.

The action area is located within designated essential fish habitat (EFH) for chum, coho, Chinook, sockeye, and pink salmon. Other managed groundfish species, such as Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole, may occur within the area during early life stages. Project sound, non-acoustic disturbance, and unauthorized pollution (e.g., oil spills) have the potential to impact PBF2.

Prey species use sound to communicate, detect prey and predators, determine orientation, migrate, select habitat, and conduct mating behavior (Popper and Hawkins 2019). Anthropogenic sound may cause temporary hearing impairment, physiological changes, changes in behavior, the masking of biologically important sounds, and mortality in fish (Popper et al. 2014; Erbe et al.

2016; Popper and Hawkins 2019). Project-related sound is not expected to cause direct injury to fish, and will only cause behavioral effects at close range. Behavioral responses of fish may vary with age and condition, environmental conditions, different sound sources, and the received sound source level. NMFS uses 150 dB re 1 µPa (rms) as the sound pressure level that may result in onset of behavioral effects to fish species. The loudest proposed activity is the use of four tugs positioning the jack-up rig at 186 dB re 1 µPa, which results in a 250 m isopleth when using a transmission loss coefficient of 15. Based on the slow speed of the tugs towing the jack-up rig combined with the large amount of open water available to prey species, effects to prey species are expected to be minor and undetectable.

Non-acoustic stressors (e.g., boat wakes, spinning propellers) may disturb a very small proportion of primary prey species. These forms of disturbance would be localized and temporary. Project vessels could potentially strike prey species; however, the vessels will be operating at slow speeds that allow primary prey to avoid collisions. Project-related gear is not expected to entangle prey species.

Prey species could be impacted by pollutants or spills. Hilcorp will follow state and federal regulations, minimizing the likelihood that prey species will be exposed to pollutants. Large spills, very large spills, and blowouts are rare and unlikely to occur during the proposed action. Should such an incident occur, there is potential for a significant impact to Cook Inlet belugas and their critical habitat, including prey species. Small spills are expected to rapidly disperse due to tide-induced turbulence and mixing, and changes in primary prey population levels, distribution, or availability to belugas are not expected. The probability of an oil spill adversely affecting prey species is very small; large spills are rare and small spills are localized and disperse rapidly. Therefore, adverse effects to PBF2 are improbable.

Primary prey species may be affected by sound, non-acoustic disturbances, and unauthorized pollution; however, any impacts to PBF2 are expected to be minor and undetectable should they occur at all.

PBF 3: Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.

Authorized discharges of pollutants are regulated through National Pollution Discharge Elimination System (NPDES) permits which undergo separate ESA section 7 consultations (NMFS 2010b). As discussed in PBF 2, accidental unauthorized spills could occur. Large spills, very large spills, and blowouts are rare and unlikely to occur during the proposed action. Should such an incident occur, there is potential for a significant impact to Cook Inlet belugas and their critical habitat, including prey species. Small spills are more likely to occur than large spills, but are expected to rapidly disperse due to tide-induced turbulence and mixing.

Chronic exposure to small spills could affect individuals within their lifetime (BOEM 2016) through accumulation of contaminants, which can impair animal populations through complex biochemical pathways that suppress immune functions and disrupt the endocrine balance of the body, causing poor growth, development, reproduction and reduced fitness (Geraci 1990; Geraci and St. Aubin 1990). Beluga whales may be vulnerable to incremental long-term accumulation of pollutants due to their longevity. A large spill, very large spill, or blowout could have significant impacts to Cook Inlet beluga critical habitat and PBF3, in particular. Spills in certain areas of habitat would increase the exposure of belugas as well as the severity of the impact, and recovery of the population could be delayed (NMFS 2016).

Toxins of a quantity harmful to Cook Inlet belugas are not expected to be released into the environment by project activities. The probability of an oil spill adversely affecting prey species is very small, and any adverse effects to PBF3 are improbable.

PBF 4: Unrestricted passage within or between the critical habitat areas.

Cook Inlet beluga whales are unlikely to be physically restricted from passing through critical habitat; however, sound and presence of vessels and other infrastructure could cause belugas to avoid certain areas while activities are occurring. Multiple project activities occurring within critical habitat Area 2 will produce underwater sound. However, Hilcorp's platforms are surrounded by open water and belugas will be able to maneuver around and away from noise producing activities. Additionally, project activity noise in excess of the 120 dB threshold will not occur between the shoreline and the MLLW line in the Susitna Delta and project vessel(s) operating in or transiting through Cook Inlet will maintain a distance of at least 2.4 km south of the MLLW line between April 15 and November 15. The impact of project vessel sound and presence on beluga passage within or between critical habitat areas is very unlikely, and adverse effects to PBF4 are improbable.

Based on the localized nature of small oil spills, the relatively rapid weathering expected for <1,000 barrels of oil, and the safeguards in place to avoid and minimize oil spills, adverse effects to PBF4 will be very minor. A large oil spill could disrupt access to affected beluga whale critical habitat areas; however, the potential to affect critical habitat is limited by existing spill response plans, the expected dispersion/weathering of the spill over hours or days, and the large spatial extent of critical habitat (BOEM 2017). The probability of a large oil spill occurring and beluga passage between critical habitat areas being restricted is extremely small.

PBF5: Waters with in-water noise below levels resulting in abandonment of critical habitat areas by Cook Inlet Belugas.

Tugging activities, production drilling, and project-related support vessel traffic will produce underwater sound in critical habitat. Project related sound in excess of the 120 dB threshold will not occur between the shoreline and the MLLW line in the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and November 15. The Tyonek platform is more than 10 km away from the MLLW near Beluga River, and the largest acoustic threshold for project activities is 4,453 m when four tugs are positioning the rig for up to one hour. Three tugs towing, holding, and positioning the jack-up rig produces an acoustic threshold of 3,850 m. The implementation of mitigation measures will reduce the likelihood that increased in-water sound levels will cause Cook Inlet beluga whales to abandon critical habitat. It is improbable that any project related sound will result in Cook Inlet belugas abandoning critical habitat.

In summary, activities associated with the proposed project are not likely to have an adverse effect on Cook Inlet beluga whale critical habitat. Impacts to the five PBFs from project stressors are expected to be minor and undetectable or improbable.

Effects of the project on Cook Inlet beluga whale critical habitat will not be discussed further.

4.2 Climate Change

One threat common to all the species we discuss in this opinion is global climate change. Because of this commonality, we present an overview here rather than in each of the species-specific narratives. A vast amount of literature is available on climate change and for more detailed information we refer the reader to these websites, which provide the latest data and links to the current state of knowledge on the topic.

https://www.ipcc.ch/reports/

https://climate.nasa.gov/evidence/

http://nsidc.org/arcticseaicenews/

https://arctic.noaa.gov/Report-Card

Increased air temperatures, increased ocean temperatures, and ocean acidification are the three facets of climate change presented here as they have the most direct impact on marine mammals and their prey.

Air temperature

Recording of global temperatures began in 1850, and the last 10 years (2014–2023) have ranked as the 10 warmest years in the 174-year record. The yearly temperature for North America has increased at an average rate of 0.23°F per decade since 1910; however, the average rate of increase is more than double the rate (0.61°F) since 1982.[1]

The Arctic (latitudes between 60ºN and 90ºN) has been warming at more than two times the rate of lower latitudes since 2000. This is due to "Arctic amplification", a characteristic of the global climate system influenced by changes in sea ice extent, albedo, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011; Richter-Menge et al. 2017; Richter-Menge 2019). The average annual temperature is now 3-4°F warmer than during the early and mid-century (Figure 5). The average annual temperature for Alaska in 2023 was 28.4°F, 2.4°F above the long-term average, ranking the 17th warmest year in the historical record for the state.[2] Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014).

[1] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202313 accessed January 2024.
[2] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202313 accessed January 2024.

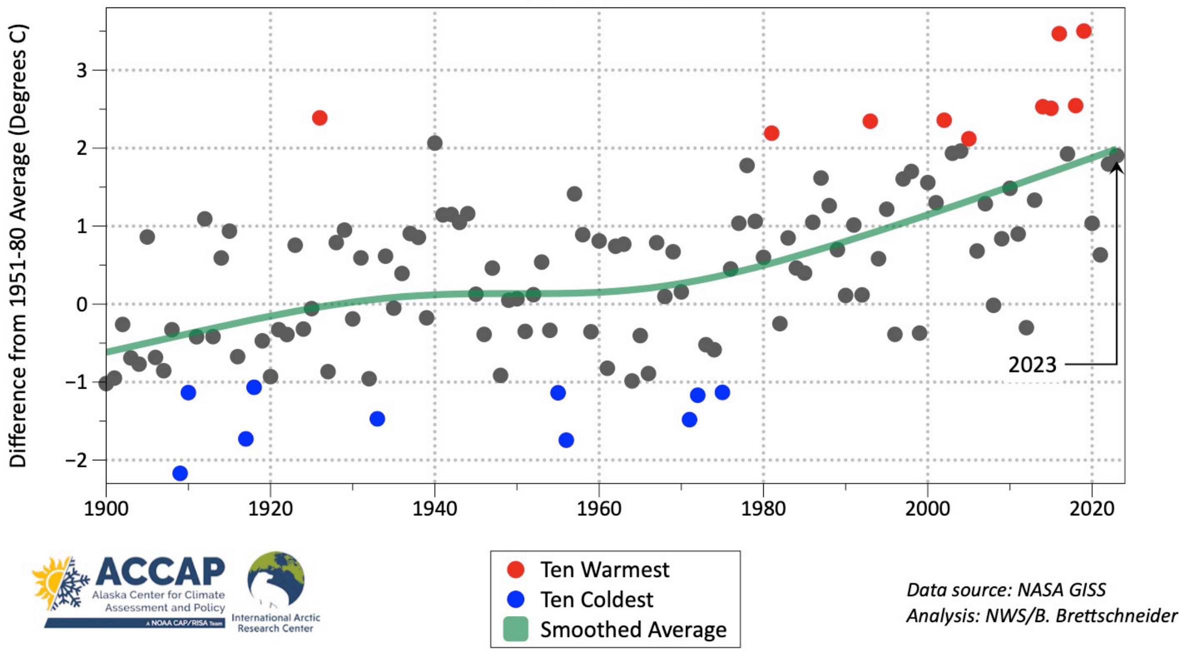

Figure 5. Alaska annual average temperature 1900 to 2023.[3]

Marine water temperature

Higher air temperatures have led to higher ocean temperatures. More than 90 percent of the excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019; Cheng et al. 2020). The five highest annual global ocean heat content (OHC) measurements, which is the amount of heat stored in the upper 2,000 m of the ocean, have all occurred in the last five years (2019–2023), and regions of the North Pacific, North Atlantic, and Southern oceans, as well as the Mediterranean Sea, recorded their highest OHC since the 1950s.[4]

The seas surrounding Alaska have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019). This effect is observed throughout the Alaska region, including the Bering, Chukchi, and Beaufort seas (Figure 6). Warmer ocean water affects sea ice formation and melt. In the first decade of the 21st century, Arctic sea ice thickness and annual minimum sea ice extent began declining at an accelerated rate and continues to decline at a rate of approximately 2.7 percent per decade (Stroeve et al. 2007; Stroeve and Notz 2018).

Seasonal ice cover in Cook Inlet has not been characterized in as much detail as the Arctic, but the same general trend of later ice formation and earlier melt is expected. Of the four species considered in this opinion, beluga whales are likely the most affected by changing ice conditions in Cook Inlet, as their entire life is spent in this single body of water.

[3] https://www.flickr.com/photos/alaskaclimategraphics/albums/72177720310047711/ accessed January 2024.
[4] https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202313 accessed January 2024.

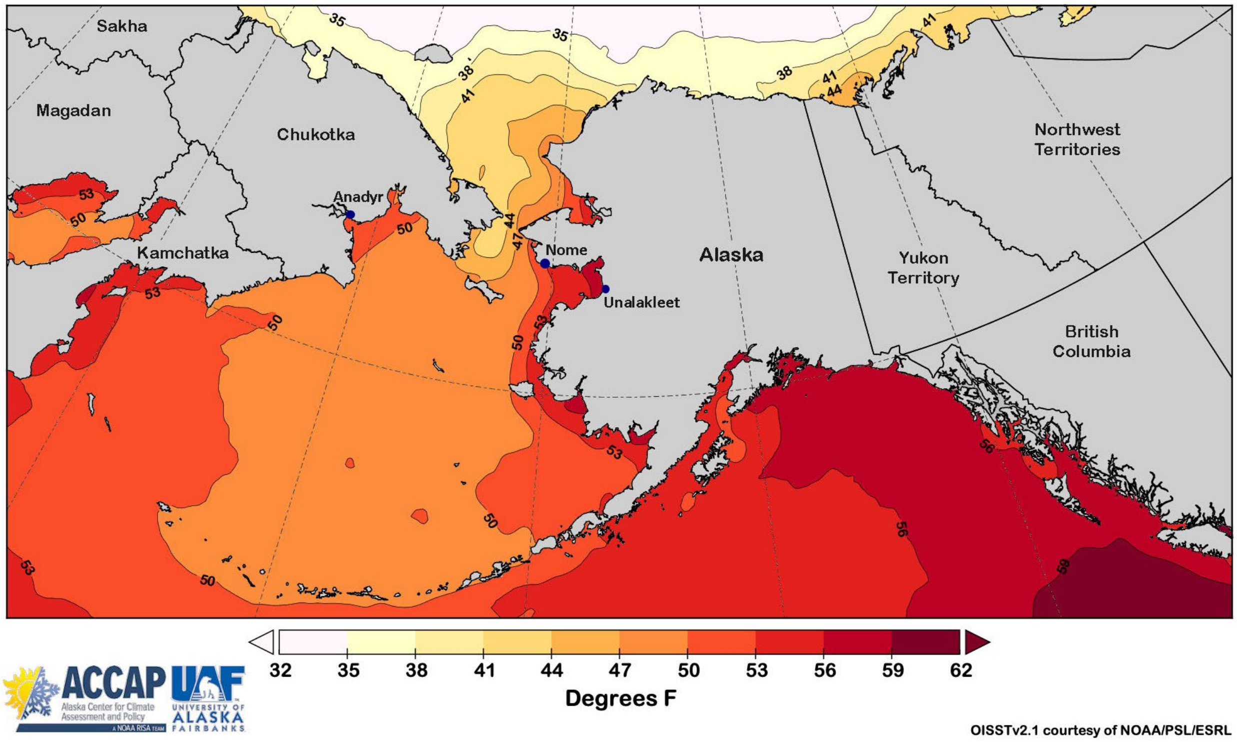

Figure 6. Highest average sea surface temperature.[5]

With the reduction in the cold-water pool in the northern Bering Sea, large scale northward movements of commercial fish stocks are underway, as previously cold-dominated ecosystems warm and fish move northward to higher latitudes (Grebmeier et al. 2006; Eisner et al. 2020). Not only fish, but plankton, crabs, and sessile invertebrates like clams are affected by these changes in water temperature (Grebmeier et al. 2006; Fedewa et al. 2020).

The marine heat wave, a coherent area of extreme warm temperature at the sea surface that persists, is another ocean water anomaly (Frölicher, Fischer and Gruber 2018). Marine heatwaves are a key ecosystem driver and nearly 70 percent of global oceans experienced strong or severe heatwaves in 2016, compared to 30 percent in 2012 (Suryan et al. 2021). The largest recorded marine heat wave occurred in the northeast Pacific Ocean, appearing off the coast of Alaska in the winter of 2013-2014 and extending south to Baja California by the end of 2015 (Frölicher, Fischer and Gruber 2018). The Pacific marine heatwave began to dissipate in mid-2016, but warming re-intensified in late-2018 and persisted through 2021 (Suryan et al. 2021; Hastings et al. 2023). Consequences of this event included an unprecedented harmful algal bloom that extended from the Aleutian Islands to southern California, mass strandings of marine mammals, shifts in the distribution of invertebrates and fish, and shifts in abundance of several fish species (Cavole et al. 2016). Cetaceans, forage fish such as capelin and herring, Steller sea lions, adult cod, Chinook and sockeye salmon in the Gulf of Alaska were all impacted by the Pacific marine heatwave (Bond et al. 2015; Peterson, Bond and Robert 2016; Sweeney, Towell and Gelatt 2018).

[5] https://www.flickr.com/photos/alaskaclimategraphics/albums/72177720310044870/ accessed January 2024.

The 2018 Gulf of Alaska Pacific cod stock assessment estimated that the female spawning biomass of Pacific cod (an important prey species for Steller sea lions) was at its lowest point in the 41-year time series, following three years of poor recruitment and increased natural mortality as a result of the 2014-2016 Pacific marine heatwave.[6] The spawning stock biomass dropped below 20 percent of the unfished spawning biomass in 2020; 20 percent is a minimum spawning stock size threshold instituted to help ensure adequate prey availability for the endangered Western DPS of Steller sea lions. The federal Pacific cod fishery in the Gulf of Alaska was closed by regulation to directed Pacific cod fishing in 2020 as a result (Barbeaux, Holsman and Zador 2020). As of late 2023, Pacific cod abundance remained at reduced levels; however, the population is showing signs of growth.[7]

Ocean Acidification

For 650,000 years or more, the average global atmospheric carbon dioxide (CO_2) concentration varied between 180 and 300 parts per million (ppm). Since the beginning of the industrial revolution in the late 1700s, atmospheric CO_2 concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008; Lüthi et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic CO_2 released, which has buffered the increase in atmospheric CO_2 concentrations (Feely et al. 2004; Feely, Doney and Cooley 2009). Despite the ocean's role as a large carbon sink, the CO_2 level continues to rise and is currently at 419 ppm.[8]

As the oceans absorb CO_2, the buffering capacity and pH of seawater is reduced. This process is referred to as ocean acidification. Ocean acidification reduces the saturation states of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells (Bates, Mathis and Cooper 2009; Reisdorph and Mathis 2014). When seawater is supersaturated with these minerals, calcification (growth) of shells is favored. Likewise, when the seawater becomes undersaturated, dissolution is favored (Feely, Doney and Cooley 2009).

High latitude oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry et al. 2009; Jiang et al. 2015). Model projections indicate that aragonite undersaturation was expected to start to occur by about 2020 in the Arctic Ocean and by 2050, all of the Arctic will be undersaturated with this mineral (Feely, Doney and Cooley 2009; Qi et al. 2017). Large inputs of low-alkalinity freshwater from glacial runoff and melting sea ice contribute to the problem by reducing the buffering capacity of seawater to changes in pH (Reisdorph and Mathis 2014). As a result, seasonal undersaturation of aragonite was already detected in the Bering Sea at sampling stations near the outflows of the Yukon and Kuskokwim Rivers and the Chukchi Sea (Fabry et al. 2009). Models and observations indicate that rapid sea ice loss will increase the uptake of CO_2 and exacerbate the problem of aragonite undersaturation in the Arctic (Yamamoto et al. 2012; DeGrandpre et al. 2020).

[6] https://apps-afsc.fisheries.noaa.gov/REFM/Docs/2018/GOA/GOApcod.pdf accessed January 2024.
[7] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2023/GOABrief.pdf accessed January 2024.
[8] https://gml.noaa.gov/ccgg/trends/global.html accessed January 2024.

Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals, bivalves, crustaceans, echinoderms and many forms of zooplankton, and, consequently, may affect Arctic food webs (Fabry et al. 2008; Bates, Mathis and Cooper 2009). Pteropods, which are often considered indicator species for ecosystem health, are prey for many species of carnivorous zooplankton, fishes including salmon, mackerel, herring, and cod, and baleen whales (Orr et al. 2005). With their thin shells and dependence on aragonite, pteropods may not be able to grow and maintain shells under increasingly acidic conditions (Lischka and Riebesell 2012). It is uncertain if these species, which play a large role in supporting many levels of the Alaskan marine food web, will be able to adapt to changing ocean conditions (Fabry et al. 2008; Lischka and Riebesell 2012).

Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Hinzman et al. 2005; Burek, Gulland and O'Hara 2008; Doney et al. 2012; Huntington et al. 2020). The physical effects on the environment described above have impacted, are impacting, and will continue to impact marine species in a variety of ways (IPCC 2014), including shifting abundances, changes in distribution, changes in timing of migration, and changes in periodic life cycles of species. For example, cetaceans with restricted distributions linked to water temperature may be particularly susceptible to range restriction (Learmonth et al. 2006; Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by climate change, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters and preferences for shelf habitats (Macleod 2009).

4.3 Status of Listed Species Likely to be Adversely Affected by the Action

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. Species status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR § 402.02.

For each species, we present a summary of information on the population structure and distribution of the species to provide a foundation for the exposure analyses that appear later in this opinion. Then we summarize information on the threats to the species and the species' status given those threats to provide points of reference for the jeopardy determinations we make later in this opinion. That is, we rely on a species' status and trend to determine whether an action's effects are likely to increase the species' probability of becoming extinct.

4.3.1 Fin Whale

4.3.1.1 Population Structure and Status

NMFS recognizes three stocks of fin whale in U.S. Pacific waters: Northeast Pacific (Alaska), California/Washington/Oregon, and Hawaii (Young et al. 2023). There are no reliable estimates of current or historical abundances for the entire Northeast Pacific fin whale stock. Many of the studies that provide information on the distribution, occurrence, and/or abundance estimates for areas within the range of the Northeast Pacific stock are over a decade or more old. A dedicated line-transect survey of the offshore waters of the Gulf of Alaska in 2013 provided an abundance estimate of 3,168 fin whales (Rone et al. 2017) and a minimum population estimate of 2,554 whales was derived from this provisional estimate (Young et al. 2023). This is an underestimate for the entire stock as it is based on surveys that covered a small portion of their range. Additional information on fin whale biology and natural history is available at: https://www.fisheries.noaa.gov/species/fin-whale

The fin whale was listed as an endangered species under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973 and fin whales continued to be listed as endangered (39 FR 41367). A recovery plan for the fin whale was published on July 30, 2010 (NMFS 2010c).

4.3.1.2 Distribution

Fin whales are typically found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes. Most migrate from tropical breeding and calving areas in the winter to colder feeding areas in the summer. In the North Pacific, 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, Bering Sea/Aleutian Islands, and around Kodiak Island (Young et al. 2023).

Fin whale feeding biologically important areas have been identified around Kodiak Island, including the mouth of Cook Inlet (Ferguson, Curtice and Harrison 2015; Wild et al. 2023), and in the Bering Sea (Ferguson et al. 2015). The highest densities of fin whales occur between June and August around Kodiak Island and from June to September in the Bering Sea (Ferguson, Curtice and Harrison 2015; Ferguson et al. 2015). Fin whales tend to return to low latitudes for the winter breeding season, though some may remain in their high latitude ranges if food resources remain plentiful. There have been year-round acoustic detections of fin whales in the Gulf of Alaska, with the highest call occurrence rates from August through December (Moore et al. 2006, Stafford et al. 2007). During winter months, fin whales have been seen over a wide geographic area from 23°N to 60°N, but winter distribution and the location of primary wintering areas (if any) are poorly known (Young et al. 2023).

4.3.1.2.1 Presence in Cook Inlet

Fin whales are rarely observed in Cook Inlet and most sightings occur near the entrance of the inlet. NMFS Cook Inlet beluga whale aerial surveys recorded 10 sightings of 28 fin whales in lower Cook Inlet between 1993 and 2022 (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). Eight sightings of 23 fin whales were observed in lower Cook Inlet in fall 2019 during Hilcorp seismic operations (Fairweather Science 2020), indicating the offshore waters of lower Cook Inlet may be utilized by fin whales in greater numbers than previously estimated, particularly during the fall period. A stranded fin whale was reported in upper Cook Inlet in June 2016.

4.3.1.3 Feeding and Prey Selection

Fin whales exhibit lunge-feeding behavior, where large amounts of water and prey are taken into the mouth and filtered through the baleen (Brodie 1993; Goldbogen et al. 2006; Goldbogen et al. 2008). In the North Pacific, 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, and capelin (Nemoto 1970; Kawamura 1980). Feeding may occur in shallow waters on prey such as sand lance (Overholtz and Nicolas 1979) and herring (Nøttestad et al. 2002), but most foraging is observed in high-productivity, upwelling, or thermal front marine waters (Panigada et al. 2008).

Average dives for foraging fin whales are 98 m deep and 6.3 minutes long, compared to non-foraging dives that are 59 m deep and 4.2 minutes long (Croll et al. 2001). Foraging dives deeper than 150 m have been documented (Panigada et al. 1999).

4.3.1.4 Reproduction

Male fin whales reach sexual maturity between 6 and 10 years of age, while females mature between 7 and 12 years old. Fin whales in the North Pacific are thought to mate around December to February. The gestation period is approximately 11 to 12 months, and females give birth in tropical and subtropical areas during midwinter. Calves weigh from 4,000 to 6,000 pounds and are nursed for 6 to 7 months. Reproductive females may produce a calf every two to three years. Despite reaching sexual maturity between 6 and 12 years of age, adult fin whales reach physical maturity around 25 years of age.

4.3.1.5 Vocalization, Hearing, and Other Sensory Capabilities

Fin whales produce a variety of low-frequency sounds in the 10 Hz to 0.2 kHz range (Thompson, Findley and Vidal 1992; Rice et al. 2021). The most typical signals are long, patterned sequences of short duration (0.5 to 2 seconds) infrasonic pulses in the 18 to 35 Hz range (Patterson and Hamilton 1964). The seasonality and stereotype of the bouts of patterned sounds suggest that these sounds are male reproductive displays (Watkins et al. 1987), while the individual counter calling data of McDonald et al. (1995) suggest that the more variable calls are contact calls. Some authors suggest there are geographic differences in the frequency, duration, and repetition of the pulses (Thompson, Findley and Vidal 1992).

Their low-frequency sounds have the potential to travel over long distances, and it is possible that fin whales participate in long-distance communication (Payne and Webb 1971, Edds-Walton 1997). The sounds may also function for long-range echolocation of large-scale geographic targets such as seamounts, which may be used for orientation and navigation (Tyack 1999).

There is no direct data on hearing in low-frequency cetaceans and the applied frequency range is expected to be between 7 Hz and 35 kHz, based on their vocalizations (NMFS 2018e). 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 is from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

4.3.1.6 Threats

4.3.1.6.1 Natural Threats

There is limited information on natural sources of injury or mortality to fin whales. Predation of fin whales by killer whales has been observed (Vidal and Pechter 1989); adults engage in flight responses (up to 40 km/h) to evade the predators, but show little resistance if overtaken (Ford and Reeves 2008). Killer whale or shark attacks may also result in serious injury or death in very young and sick individuals (Perry, DeMaster and Silber 1999).

An unusual mortality event (UME) of thirteen fin whales stranded in the Gulf of Alaska with a peak occurrence from May 1 to November 30, 2015 (Savage 2017). A definitive cause of the UME was not determined, although the primary cause likely involved one or more consequences of shifting environmental conditions such as exposure to algal toxins or lack of prey.

4.3.1.6.2 Anthropogenic Threats

Ship strikes are a known threat for fin whales, and this species may be more vulnerable to strikes due to their large body size and the amount of time they spend at the surface (Sèbe et al. 2022). Reductions in sea-ice coverage may lead to range extension and increased susceptibility to ship strikes from increased shipping in the Chukchi and Beaufort seas. Between 2009 and 2021, six ship strikes of fin whales were reported in Alaskan waters (Helker, Allen and Jemison 2015; Delean et al. 2020; Freed et al. 2023). Vessel strikes of fin whales in Alaska are likely underreported, which is likely due to their preference for offshore waters, the animal sinking before it is visible (Rockwood, Calambokidis and Jahncke 2017), and/or the carcass washing ashore in a remote location inaccessible to humans.

Fin whales may also experience significant injury and mortality from fishing gear and entanglements. Between 2009 and 2021, two fin whales were reported as entangled or entrapped in gear in Alaskan waters (Helker, Allen and Jemison 2015; Delean et al. 2020; Freed et al. 2023).

4.3.2 Mexico and Western North Pacific DPS Humpback Whales

4.3.2.1 Population Structure and Status

In 1970, the humpback whale was listed under the ESCA as endangered worldwide (35 FR 18319; December 2, 1970), primarily due to overharvest by commercial whaling. Humpback whales continued to be listed as endangered following passage of the ESA, and are also considered "depleted" under the MMPA.

NMFS conducted a global status review of humpback whales (Bettridge et al. 2015) and published a final rule recognizing 14 DPSs on September 8, 2016 (81 FR 62260). Four of these DPSs were designated as endangered and one as threatened, with the remaining nine not warranting ESA listing status.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, Wade (2021) concluded that humpbacks feeding in Alaska waters belong primarily to the Hawaii DPS (recovered), with small numbers from the Mexico DPS (threatened) and WNP DPS (endangered). Whales from these three DPSs overlap on feeding grounds off Alaska, and are visually indistinguishable unless individuals have been photo-identified on breeding grounds and again on feeding grounds. All waters off the coast of Alaska may contain ESA-listed humpbacks.

There are approximately 2,913 animals in the Mexico DPS and 1,084 animals in the WNP DPS (Wade 2021). The population trend is unknown for both DPSs. The Hawaii DPS is estimated at 11,540 animals, and the annual growth rate is between 5.5 and 6.0 percent (Wade 2021). Humpbacks in Cook Inlet, which is considered part of their Gulf of Alaska summer feeding area, are comprised of approximately 89 percent Hawaii DPS individuals, 11 percent Mexico DPS individuals, and less than 1 percent WNP DPS individuals. Additional information on humpback whale biology and natural history is available at: https://www.fisheries.noaa.gov/species/humpback-whale

4.3.2.2 Distribution

Humpback whales are found in all oceans of the world with a broad geographical range from tropical to temperate waters in the Northern Hemisphere and from tropical to near-ice-edge waters in the Southern Hemisphere. Seasonal migrations occur from their tropical calving and breeding grounds in winter to their high-latitude feeding grounds in summer.

Most humpbacks that summer in Alaska winter in temperate or tropical waters near Mexico, Hawaii, or in the western Pacific near Japan. In the spring, these animals migrate back to Alaska, where food is abundant. They tend to concentrate in several areas, including Southeast Alaska, Prince William Sound, Kodiak, the Bering Sea, and along the Aleutian Islands (Wild et al. 2023). Large numbers of humpbacks have also been reported in waters over the continental shelf, extending up to 185 km offshore in the western Gulf of Alaska (Wade 2021). Some individuals remain in Alaska waters year-round.

4.3.2.2.1 Presence in Cook Inlet

Humpback whales have been observed throughout Cook Inlet, but are primarily found in the lower inlet. NMFS Cook Inlet beluga whale aerial surveys recorded 97 sightings of 211 humpbacks between 1993 and 2022; all were located in lower Cook Inlet (Figure 7; Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). There were 14 sightings of 38 humpback whales in lower Cook Inlet in fall 2019 during Hilcorp seismic operations (Fairweather Science 2020).

Farther north in Cook Inlet, two humpbacks were observed north of the Forelands during marine mammal monitoring in May and June of 2015 (Jacobs Engineering Group 2017). Marine mammal monitoring near the mouth of Ship Creek also recorded two humpback whale sightings, likely of the same individual, in September 2017 (ABR 2017). Three humpback whales were recorded near Ladd Landing, north of the Forelands, in 2018 during marine mammal monitoring (Sitkiewicz et al. 2018). One humpback was observed in July 2022 during transitional dredging at the Port of Alaska (61 North Environmental 2022b). Stranded humpbacks were reported in upper Cook Inlet in 2015, 2017, and 2019. Sightings of humpback whales in the action area are uncommon, and few, if any, are expected.

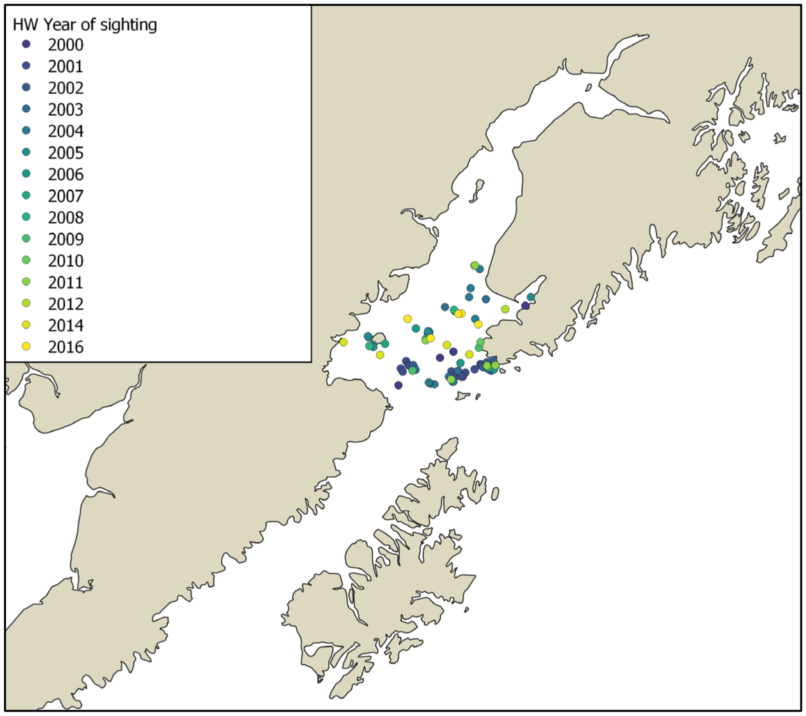

Figure 7. Humpback whale sightings recorded during NMFS Cook Inlet beluga whale aerial surveys from 2000-2016.

4.3.2.3 Feeding and Prey Selection

Humpback whales exhibit flexible feeding strategies, sometimes foraging alone and sometimes cooperatively (Clapham 1993). Humpback whales are 'gulp' or 'lunge' feeders, capturing large mouthfuls of prey during feeding rather than continuously filtering food, as may be observed in some other large baleen whales (Goldbogen et al. 2008; Simon, Johnson and Madsen 2012). When lunge feeding, whales advance on prey with their mouths wide open, then close their mouths around the prey and trap them by forcing engulfed water out past the baleen plates. Compared to some other baleen whales, humpbacks are relatively generalized in their prey selection. In the Northern Hemisphere, known prey includes euphausiids (krill), copepods, juvenile salmonids, herring, Arctic cod, walleye pollock, pteropods, and cephalopods (Johnson and Wolman 1984; Perry, DeMaster and Silber 1999; Straley et al. 2018).

In the North Pacific, humpback whales forage in the coastal and inland waters along California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Tomilin 1967; Johnson and Wolman 1984). The waters surrounding Kodiak Island have been identified as a biologically important area for seasonal feeding and are considered active May through September (Wild et al. 2023).

4.3.2.4 Reproduction

Humpbacks in the Northern Hemisphere give birth and presumably mate on low-latitude wintering grounds from January to March. Females attain sexual maturity at five years old in some populations and exhibit a mean calving interval of approximately two years (Clapham 1992; Barlow and Clapham 1997). Gestation is about 12 months, and calves are probably weaned by the end of their first year (Perry, DeMaster and Silber 1999).

4.3.2.5 Vocalization, Hearing, and Other Sensory Capabilities

Mysticetes are likely most sensitive to sound from an estimated tens of hertz to approximately ten kilohertz (Southall et al. 2007). Evidence suggests that humpbacks can hear sounds as low as 7 Hz up to 24 kHz, and possibly as high as 30 kHz (Ketten 1997; Au et al. 2006). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with a generalized hearing range between 7 Hz and 35 kHz (NMFS 2018e). 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 hearing.

Humpback whales produce a wide variety of sounds (especially animals in mating groups) ranging from 20 Hz to 10 kHz (Tyack 1981; Silber 1986). During the breeding season males sing long, complex songs, with frequencies in the 20 to 5,000 Hz range and intensities as high as 181 dB (Payne 1970; Winn, Perkins and Poulter 1970; Thompson, Cummings and Ha 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson, Winn and Perkins 1979). The songs appear to have an effective range of approximately 10 to 20 km.

Social sounds associated with male aggressive behavior in breeding areas are very different than songs and extend from 50 Hz to 10 kHz (or higher), with most energy in components below 3 kHz (Tyack and Whitehead 1983; Silber 1986). These sounds appear to have an effective range of up to nine kilometers (Tyack and Whitehead 1983).

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 to 0.8 seconds and source levels of 175-192 dB (Thompson, Cummings and Ha 1986). These sounds are thought to be attractive and appear to rally animals to the feeding activity (D'Vincent, Nilson and Hanna 1985; Sharpe and Dill 1997).

4.3.2.6 Threats

4.3.2.6.1 Natural Threats

There is limited information on natural sources of injury or mortality to humpback whales. Based upon the prevalence of tooth marks, attacks by killer whales appear to be highest among humpback whales migrating between Mexico and California, although populations throughout the Pacific Ocean appear to be targeted to some degree (Steiger et al. 2008). Juveniles appear to be the primary age group targeted.

Thirteen marine mammal species in Alaska were examined for domoic acid; humpback whales indicated a 38 percent prevalence (Lefebvre et al. 2016). Humpback whales in the study were also found to have the highest prevalence of saxitoxin with 50 percent (Lefebvre et al. 2016).

4.3.2.6.2 Anthropogenic Threats

Historically, commercial whaling represented the greatest threat to every population of humpback whale. In 1963, the International Whaling Commission (IWC) banned commercial hunting of humpback whales, and, as a result, this threat has largely been curtailed. No commercial whaling occurs within the range of Mexico DPS humpbacks. Japan resumed commercial whaling in its territorial sea and exclusive economic zone, which is within the WNP DPS humpback range, in 2019. Previously, "commercial bycatch whaling" was documented within the WNP DPS humpback range in Japan and South Korea (Bettridge et al. 2015). Alaska Native subsistence hunters are not granted aboriginal subsistence whaling quotas under the IWC to take humpback whales.

Vessel strike is one of the main threats and sources of anthropogenic impacts to humpback whales in Alaska. Neilson et al. (2012) summarized 108 ship strike events in Alaska from 1978 to 2011; 86 percent involved humpback whales. Eighteen humpbacks were struck by vessels between 2016 and 2020 (Freed et al. 2022). Most ship strikes of humpback whales are reported in Southeast Alaska (Helker et al. 2019), where high vessel traffic overlaps with whale presence.

Fishing gear entanglement is another major threat. Entanglement may result in only minor injury or may significantly affect individual health, reproduction, or survival. Every year humpback whales are reported entangled in fishing gear in Alaska, particularly pot gear and gill net gear. Between 2016 and 2020, entanglement of humpback whales (n = 47) was the most frequent human-caused source of mortality and injury of large whales in Alaska (Freed et al. 2022).

4.3.3 Cook Inlet DPS Beluga Whale

4.3.3.1 Population Structure and Status

Beluga whales inhabiting Cook Inlet belong to one of five distinct stocks found in Alaska (Young et al. 2023). The best historical abundance estimate of the Cook Inlet beluga population is 1,293 whales, based on a survey conducted in 1979 (Calkins 1989). NMFS began conducting comprehensive, systematic aerial surveys of the population in 1993. These surveys documented a decline in abundance from 653 whales in 1994 to 347 whales in 1998. In response to this nearly 50 percent decline, NMFS designated the Cook Inlet beluga population as depleted under the MMPA (65 FR 34590; May 31, 2000). Abundance data collected between 1999 and 2008 indicated that the population did not increase. On October 22, 2008, NMFS published a final rule to list the Cook Inlet beluga whale as endangered under the ESA (73 FR 62919).

The best current abundance estimate for the population is 331 belugas (95 percent probability interval of 290 to 386), and is based on aerial surveys conducted in June 2022 (Goetz et al. 2023). A declining trend of 2.3 percent per year occurred from 2008 to 2018 (Shelden and Wade 2019), and a comparison of the population estimate over time is presented in Figure 8. With the addition of the 2021 and 2022 survey data, the trend in the updated time-series suggests the population is stable and may be increasing slightly (Goetz et al. 2023).

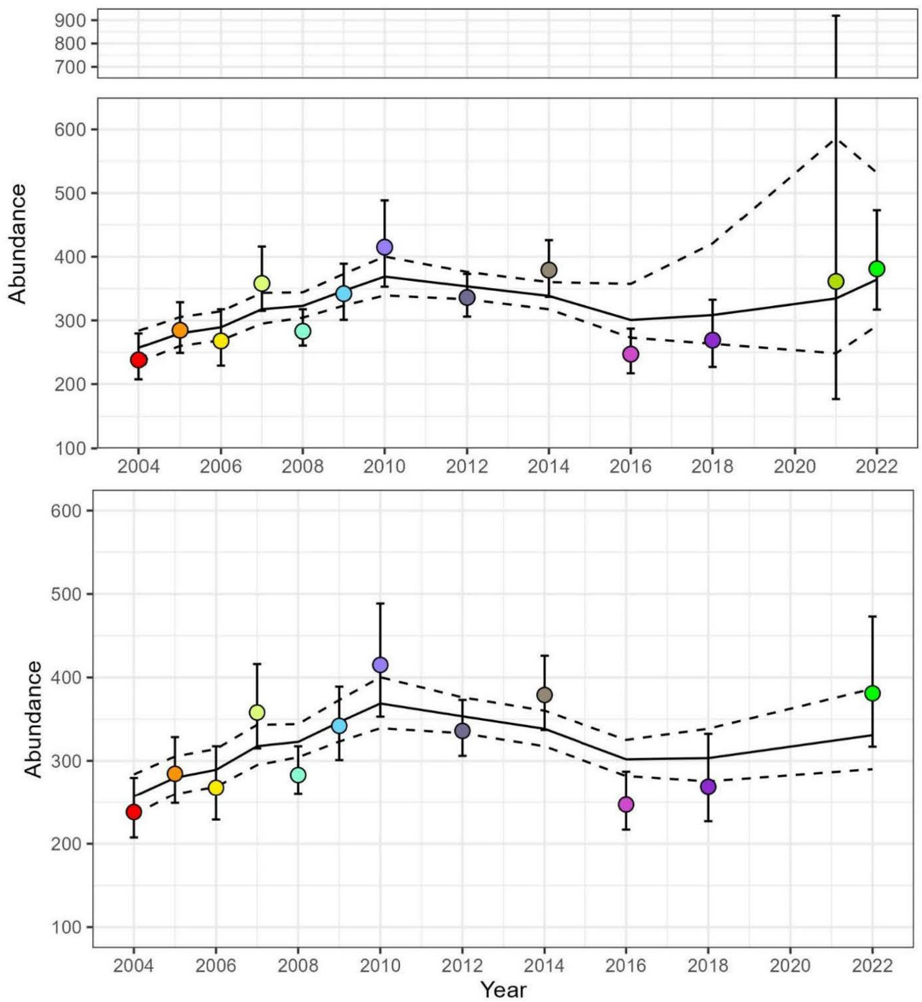

Figure 8. Cook Inlet beluga abundance estimates (circles), moving average (solid line), and 95 percent probability intervals (dotted lines and error bars; Goetz et al. 2023). Top panel includes 2021 survey data.

Annual mortality, estimated from stranding deaths relative to the population size, averaged 2.2 percent between 2005 and 2017 (McGuire et al. 2021). This is a minimum estimate due to the challenges associated with detecting stranded animals in Cook Inlet. It is estimated that the mean number of reported beluga carcasses represents less than one third of the total number of dead belugas each year (McGuire et al. 2021). In the stranding dataset, mortality was greatest for adults of reproductive age, followed by calves, with fewer subadults and no adults older than 49 years (McGuire et al. 2021). Higher mortality of the very old and the very young compared to other age groups is typical in healthy mammal populations, and the documented mortality rates for Cook Inlet belugas are unusual (McGuire et al. 2021). Cook Inlet beluga whales are dying of as-yet unknown causes at relatively younger but still reproductive ages, with few surviving to reach their potential lifespan of 70+ years, as reported in other beluga populations.

A detailed description of Cook Inlet beluga whale biology, habitat, and extinction risk factors can be found in the final listing rule for the species (73 FR 62919, October 22, 2008), the Conservation Plan (NMFS 2008a), and the Recovery Plan (NMFS 2016). Additional information about Cook Inlet beluga whales can be found on the NMFS AKR web site at: https://www.fisheries.noaa.gov/species/beluga-whale

4.3.3.2 Distribution

Cook Inlet beluga whales remain in Cook Inlet year-round and have seasonal movement patterns. During the summer and fall, belugas typically occur in shallow coastal waters and are concentrated near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay (Shelden et al. 2015b; Castellote et al. 2016a). Ice formation in the upper Inlet during the winter may restrict access to nearshore habitat (Ezer et al. 2013), and belugas are more dispersed in deeper waters in the mid-inlet to Kalgin Island, as well as in the shallow waters along the west shore to Kamishak Bay.

Distribution data, including data from aerial surveys and acoustic monitoring, indicate that the beluga range in Cook Inlet has contracted markedly (Figure 9; Shelden et al. 2015b; Shelden and Wade 2019). The distributional shift and range contraction coincided with the decline in abundance (Moore et al. 2000; NMFS 2008a; Goetz et al. 2012). Surveys in the 1970s showed belugas dispersing into the lower inlet by mid-summer, and prior to the 1990s, whales used areas throughout the upper, mid, and lower inlet during the spring, summer, and fall (Huntington 2000; Rugh, Shelden and Mahoney 2000; NMFS 2008a; Rugh, Shelden and Hobbs 2010). Currently, almost the entire population is found only in northern Cook Inlet from late spring into the fall.

The Susitna Delta is a very important area for Cook Inlet beluga whales, particularly in the summer and fall months (Shelden et al. 2015b; Castellote et al. 2020; McGuire et al. 2020a). Groups of 200 to 300 individuals, including adults, juveniles, and neonates, have been observed in the Susitna River Delta area in recent years (McGuire, Stephens and Bisson 2014; McGuire et al. 2020a). Acoustic recorders at the Little Susitna River detected a peak from late May to early June, and a large peak from July through August (Castellote et al. 2016b). At the Beluga River, acoustic recorders detected three peaks of occurrence: mid-February to early April, June to mid-July (the strongest peak), and mid-November and December (Castellote et al. 2016a). The peaks in May and June appear to coincide with eulachon runs (Vincent-Lang and Queral 1984), and the peaks from June and July coincide with salmon runs (particularly silver and chinook salmon; Brenner, Munro and Larsen 2019).

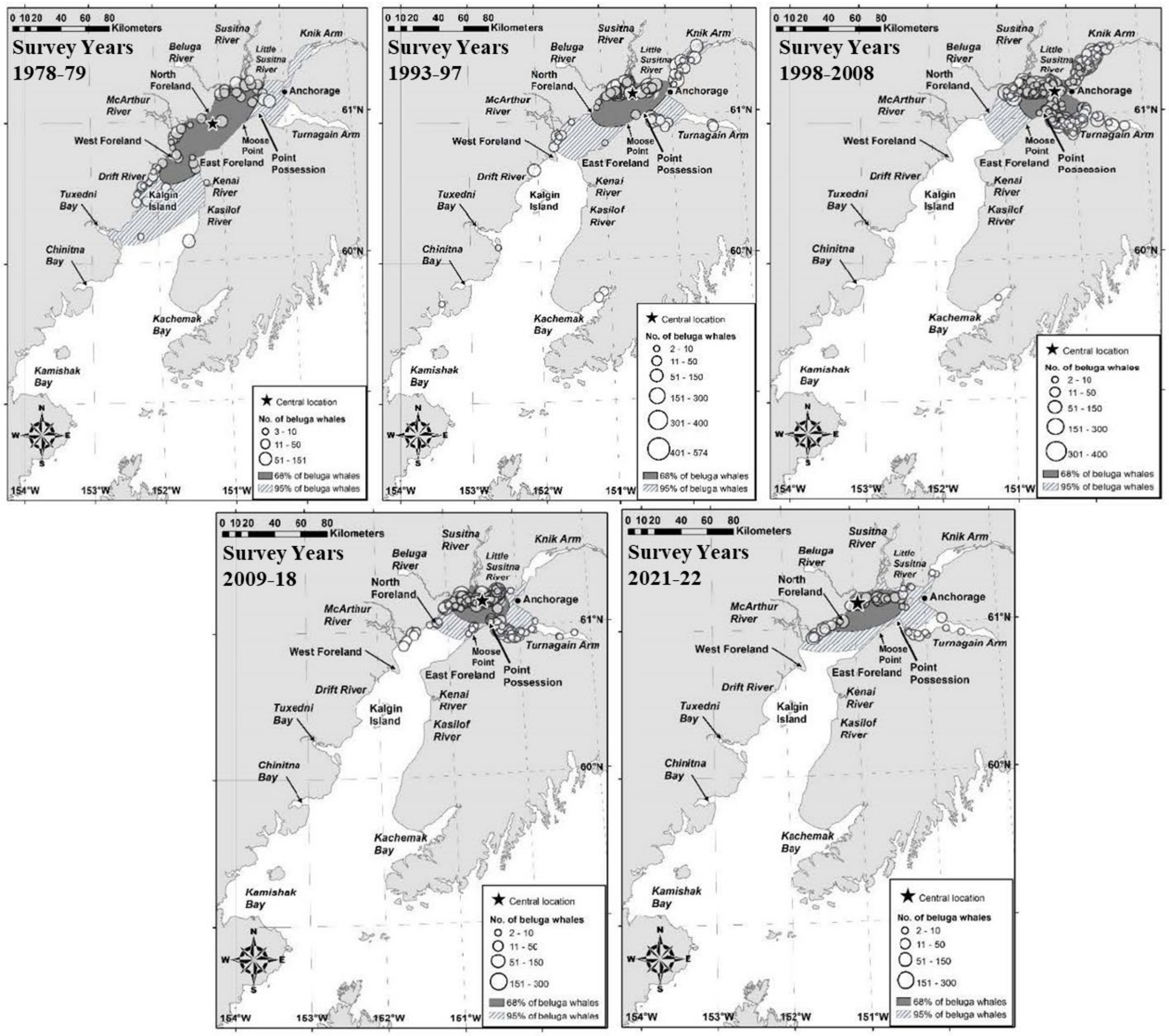

Figure 9. Areas occupied by Cook Inlet beluga whales (Goetz et al. 2023).

4.3.3.2.1 Presence in the Action Area

The area around the East Forelands between Nikiski, Kenai, and Kalgin Island appears to provide important habitat in winter, early spring, and fall. Belugas were historically (1970s-1990s) observed in and around the Kenai and Kasilof rivers throughout the summer (Shelden et al. 2015b). Recent monitoring efforts indicate beluga presence in the area from fall through the spring (Ovitz 2019; Castellote et al. 2020; Kumar, Castellote and Gill 2024).[9] The Bureau of Ocean Energy Management (BOEM) funded aerial surveys conducted in early spring and late fall between 2018-2021, and beluga groups were observed in the upper inlet as well as the Kenai and Kasilof rivers, Tuxedni Bay, and near Kalgin Island in the lower inlet (NMFS 2022).

From December 2015 through January 2016, Tyonek Platform personnel regularly observed 200 to 300 beluga whales. The animals appeared to be drifting by the platform in the open water

[9] https://akbmp.org/beluga-observation-log/ accessed January 2024.

areas between ice sheets on the afternoon tides. During the Harvest Cook Inlet Pipeline Extension Project (CIPL) in 2018, observers based on the Tyonek Platform and onshore at Ladd Landing recorded 143 sightings of 814 belugas between May and August (Sitkiewicz et al. 2018).

Acoustic monitoring studies have been conducted in Cook Inlet since 2008 (Lammers et al. 2012; Castellote et al. 2020; Castellote et al. 2021; Castellote et al. 2023; Kumar, Castellote and Gill 2024). Beluga detections were high in the upper inlet between November and April, specifically in the coastal areas from Trading Bay to the Little Susitna River. Detections were also made in several areas of the lower inlet, including the Kenai River, Tuxedni Bay, Big River, and northwest of Kalgin Island (Castellote et al. 2020; Castellote et al. 2023; Kumar, Castellote and Gill 2024). Acoustic detections also indicate that belugas may be present in or around the mouth of the Kenai River throughout the winter and spring (Castellote et al. 2016a; Kumar, Castellote and Gill 2024).

4.3.3.3 Feeding and Prey Selection

Cook Inlet beluga whales have diverse diets (Quakenbush et al. 2015; Nelson et al. 2018), including multiple fish and benthos species, and often forage at river mouths. Primary prey species consist of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole. Belugas seasonally shift their distribution within Cook Inlet in relation to the timing of fish runs and seasonal changes in ice and currents (NMFS 2016).

The seasonal availability of energy-rich prey is very important to the energetics of belugas (Abookire and Piatt 2005; Litzow et al. 2006; John et al. 2024). Cook Inlet belugas have much lower fat reserves in the spring than after feeding on abundant eulachon and salmon in the spring and summer (NMFS 2007; Saupe et al. 2014). Eating fatty prey and building up fat reserves in the spring and summer may allow beluga whales to sustain themselves during periods of reduced prey availability in winter or when metabolic needs are higher (NMFS 2007).

4.3.3.4 Reproduction

Probable mating behavior was observed in April and May of 2014 in Trading Bay (Lomac-MacNair et al. 2016). Conception is predicted to peak from March through May, based on analysis of stranded neonates, fetuses, and calves of the year; however, conception can occur over a wide period of up to seven months (Shelden et al. 2020). Neonates have been observed between early July and mid-October (McGuire and Stephens 2017), and the only documented beluga birth occurred on July 20, 2015 in the Susitna River Delta (McGuire and Stephens 2017). Most calving in Cook Inlet is assumed to occur from mid-May to mid-July (Calkins 1989), but calving could occur through the entire ice-free period from April through November (Shelden et al. 2020). Young beluga whales are nursed for two years and may continue to associate with their mothers for a considerable time thereafter (Colbeck et al. 2013).

4.3.3.5 Vocalization, Hearing, and Other Sensory Capabilities

Beluga whales produce sounds for communication and echolocation. Belugas, and other odontocetes, make sounds across some of the widest frequency bands that have been measured in any animal group. For their social interactions, belugas emit communication calls with an average frequency range of about 0.2 to 7.0 kHz (Garland, Castellote and Berchok 2015). Belugas produce a variety of audible whistles, squeals, clucks, mews, chirps, trills, and bell-like tones (Castellote et al. 2014). At the higher-frequency end of their hearing range, belugas use echolocation signals with peak frequencies at 40-120 kHz, which help to navigate and hunt in dark or turbid waters where vision is limited (Au 2000). Beluga whales are one of five non-human mammal species for which there is convincing evidence of frequency modulated vocal learning (Payne and Payne 1985; Tyack 1999; Stoeger et al. 2012).

Even among odontocetes, beluga whales are known to be one of the most adept users of sound. The unfused vertebrae and highly movable head of the beluga whale may have allowed for adaptation of their sophisticated directional hearing. Multiple studies have examined hearing sensitivity of belugas in captivity (Awbrey, Thomas and Kastelein 1988; Johnson, McManus and Skaar 1989; Klishin, Popov and Supin 2000; Ridgway et al. 2001; Finneran et al. 2002a; Finneran et al. 2002b; Finneran et al. 2005; Mooney et al. 2008). In the first report of hearing ranges of belugas in the wild, Castellote et al. (2014) documented a wide range of sensitive hearing from 20-110 kHz, with minimum detection levels around 50 dB. These results were similar to the ranges reported in the captive studies; however, the levels and frequency range of the wild belugas indicate the whales have sensitive hearing compared to previous studies of belugas and other odontocetes (Houser and Finneran 2006; Houser et al. 2018). Most of these studies measured beluga hearing in very quiet conditions. Tidal currents in Cook Inlet regularly produce ambient sound levels well above 100 dB (Lammers et al. 2013), and beluga signal intensity can change with location and background noise levels (Au et al. 1985).

4.3.3.6 Threats

The Cook Inlet Beluga Recovery Plan (NMFS 2016) addresses ten principal threats to the population. Table 4 provides a summary of these threats and their potential impact on Cook Inlet beluga recovery.

Table 4. Cook Inlet beluga whale recovery plan ten principal threats summary.

Threat Type	ESA § 4(a)(1) Factor*	Major Effect	Extent	Frequency	Trend	Probability	Magnitude	Relative Concern
Catastrophic events (e.g., natural disasters, spills, mass strandings)	A, D, E	Mortality, compromised health, reduced fitness, reduced carrying capacity	Localized	Intermittent and Seasonal	Stable	Medium to High	Variable Potentially High	High
Cumulative effects	C, D, E	Chronic stress; reduced resilience	Range wide	Continuous	Increasing	High	Unknown Potentially High	High
Noise	A, D, E	Compromised communication and echolocation, physiological damage, habitat degradation	Localized & Range wide	Continuous, Intermittent, and Seasonal	Increasing	High	Unknown Potentially High	High
Disease agents (e.g., pathogens; parasites; harmful algal blooms)	C	Compromised health, reduced reproduction	Range wide	Intermittent	Unknown	Medium to High	Variable	Medium
Habitat loss or degradation	A	Reduced carrying capacity, reduced reproduction	Localized & Range wide	Continuous and Seasonal	Increasing	High	Medium	Medium
Reduction in prey	A, D, E	Reduced fitness (reproduction and/or survival); reduced carrying capacity	Localized & Range wide	Continuous, Intermittent, and Seasonal	Unknown	Unknown	Unknown	Medium
Unauthorized take	A, E	Behavior modification, displacement, injury or mortality	Range wide, localized hotspots	Seasonal	Unknown	Medium	Variable	Medium
Pollution	A	Compromised health	Localized & Range wide	Continuous, Intermittent, and Seasonal	Increasing	High	Low	Low
Predation	C	Injury or mortality	Range wide	Intermittent	Stable	Medium	Low	Low
Subsistence hunting	B, D	Injury or mortality	Localized	Intermittent	Stable or Decreasing	Low	Low	Low

*A: The present or threatened destruction, modification, or curtailment of its habitat or range; B: Overutilization for commercial, recreational, scientific, or educational purposes; C: Disease or predation; D: The inadequacy of existing regulatory mechanisms; and, E: Other natural or manmade factors affecting its continued existence

4.3.4 Western DPS Steller Sea Lion

4.3.4.1 Status and Population Structure

On November 26, 1990, NMFS published a final rule to list Steller sea lions as threatened (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs (62 FR 24345; May 5, 1997); the Eastern DPS was listed as threatened and the Western DPS was listed as endangered. On November 4, 2013, NMFS published a final rule to delist the Eastern DPS (78 FR 66140). Information on Steller sea lion biology and habitat (including critical habitat) is available in the revised Steller Sea Lion Recovery Plan (NMFS 2008b) and five-year Status Review (NMFS 2020).

The Western DPS of Steller sea lions decreased from an estimated 220,000 to 265,000 animals in the late 1970s to fewer than 50,000 in 2000 (Young et al. 2023). Factors that may have contributed to this decline include incidental take in fisheries, competition with fisheries for prey, legal and illegal shooting, predation, exposure to contaminants, disease, and ocean regime shift-driven climate change (NMFS 2008b). The most recent comprehensive surveys of Western DPS Steller sea lions estimated a total Alaska population (both pups and non-pups) of 49,320 (Sweeney et al. 2023). Between 2007 and 2022, Western DPS Steller sea lion pups increased by 0.50 percent per year and non-pups increased by 1.05 percent per year (Sweeney et al. 2023). While the data show the overall population trend is positive, abundance and trends are highly variable across regions and age classes.

Pup counts declined in the eastern and central Gulf of Alaska between 2015 and 2017, counter to the increases observed in both regions since 2002 (Sweeney et al. 2017). These declines may have been due to changes in prey availability from the marine heatwave that occurred in the northern Gulf of Alaska from 2014 to 2016 (Bond et al. 2015; Petersen et al. 2016; Muto et al. 2021). Pup counts rebounded to 2015 levels in 2019; however, non-pup counts in the eastern, central, and western Gulf of Alaska regions declined (Muto et al. 2021).

4.3.4.2 Distribution

Steller sea lions range along the North Pacific rim from northern Japan to California, with centers of abundance in the Gulf of Alaska and Aleutian Islands (Figure 9; Loughlin, Rugh and Fiscus 1984). Although Steller sea lions seasonally inhabit coastal waters of Japan in the winter, breeding rookeries outside of the U.S. are only located in Russia (Burkanov and Loughlin 2005). Steller sea lions are not known to migrate annually, but individuals may widely disperse outside of the breeding season (late May to early July; Jemison et al. 2013; Muto et al. 2021).

Land sites used by Steller sea lions are referred to as rookeries and haulouts (Figure 10). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season. Haulouts are used by all age classes of both sexes but are generally not where sea lions reproduce. At the end of the reproductive season, some females may move with their pups to other haulout sites and males may migrate to distant foraging locations (Spalding 1964; Pitcher and Calkins 1981). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997; Burkanov and Loughlin 2005). Round trip migrations of greater than 6,500 km have been documented for individual Steller sea lions (Jemison et al. 2013).

Most adult Steller sea lions occupy rookeries during the pupping and breeding season (Pitcher and Calkins 1981; Gisiner 1985), and exhibit high site fidelity (Sandegren 1970). During the breeding season some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (Rice 1998; Ban 2005; Call and Loughlin 2005).

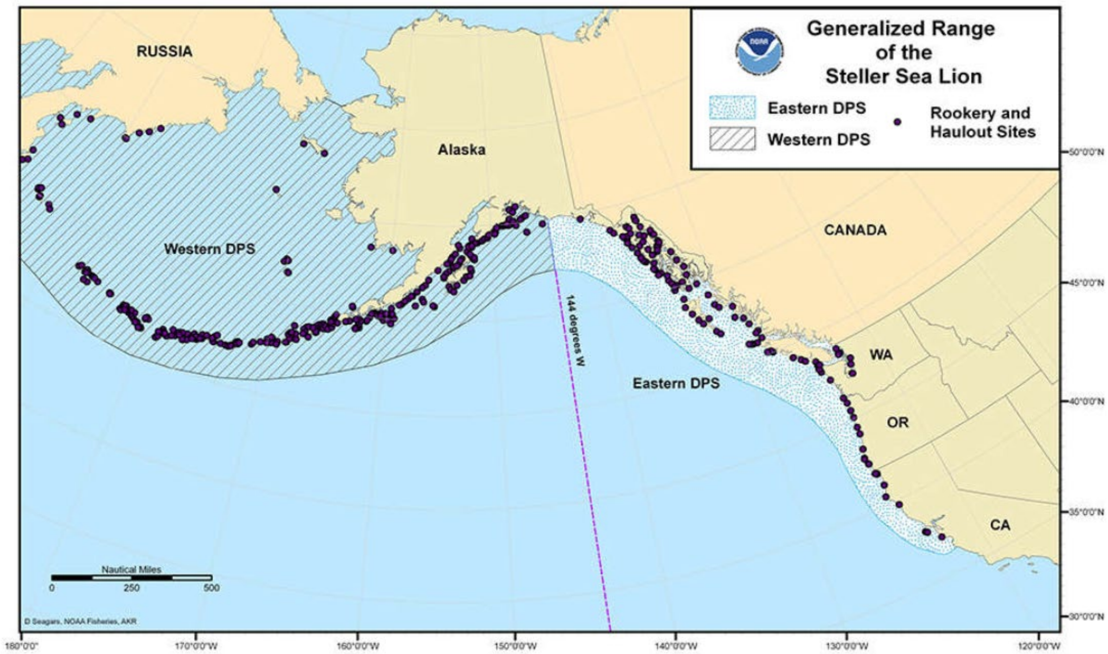

Figure 10. Ranges, rookeries, and haulout sites of Western and Eastern DPS Steller sea lions.

4.3.4.2.1 Presence in Cook Inlet

Sightings of Steller sea lions in upper and middle Cook Inlet are rare, and density data are not available for this region. Projects at the Port of Alaska in upper Cook Inlet have recorded several Steller sea lion sightings in recent years. During marine mammal monitoring efforts associated with the Petroleum and Cement Terminal Project, there were six Steller sea lion sightings in 2020 (61 North Environmental 2021) and nine in 2021(61 North Environmental 2022a; Easley-Appleyard and Leonard 2022). Three Steller sea lions were observed in 2022 during monitoring for the South Floating Dock construction (61 North Environmental 2022c).

There have also been sightings of small numbers of Steller sea lions during oil and gas projects farther south in Cook Inlet. During the SAExploration 3D seismic program in 2015, one sighting occurred northeast of North Foreland, one between the East and West Forelands, and one near Nikiski (Kendall et al. 2015). Observers recorded one sighting of two Steller sea lions near Ladd Landing during the Harvest Alaska CIPL project in 2018 (Sitkiewicz et al. 2018). Five Steller sea lions were observed in 2019 during Hilcorp seismic operations in lower Cook Inlet (Fairweather Science 2020). During a waterfowl survey in 2022, an estimated 25 Steller sea lions were observed hauled-out at low tide in the Lewis River on the west side of Cook Inlet (K. Lindberg, pers. comm., August 15, 2022).

NMFS Cook Inlet beluga whale aerial surveys recorded 64 sightings of 1,111 Steller sea lions between 1993 and 2022; the majority were located south of the Forelands (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). About 3,600 Steller sea lions use terrestrial sites in lower Cook Inlet (Sweeney et al. 2017), with additional individuals foraging in the area. The nearest major rookery or haulout site to the action area is over 175 km away (Figure 11).

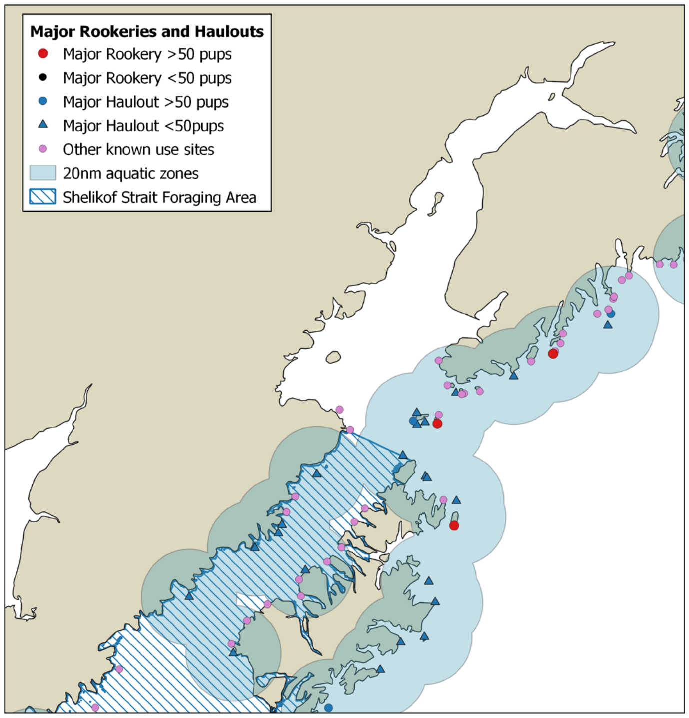

Figure 11. Steller sea lion major rookeries and haulouts in lower Cook Inlet area.

4.3.4.3 Feeding, Diving, Hauling Out, and Social Behavior

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the seasonal presence of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher and Calkins 1981; Calkins and Goodwin 1988; NMFS 2008b), and occasionally other marine mammals and birds (Pitcher and Fay 1982; NMFS 2008b).

During summer, Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 37 km of breeding rookeries (Merrick and Loughlin 1997), and begin a regular routine of alternating foraging trips at sea with nursing their pups on land a few days after birth. Steller sea lions tend to make shallow dives of less than 250 m but are capable of deeper dives (NMFS 2018e). Female foraging dives during summer tend to be closer to shore and are shallower (Merrick and Loughlin 1997). Winter foraging trips tend to be longer in duration, farther from shore, and with deeper dives.

Steller sea lions are gregarious animals that often travel in large groups of up to 45 individuals (Keple 2002), and rafts of several hundred animals are often observed adjacent to haulouts.

Individual rookeries and haulouts may be comprised of hundreds of animals. At sea, groups usually consist of females and subadult males, as adult males are usually solitary (Loughlin 2002).

4.3.4.4 Reproduction

Male Steller sea lions reach sexual maturity between ages three and seven, but do not reach physical maturity and participate in breeding until about eight to ten years of age (Pitcher and Calkins 1981). Female Steller sea lions reach sexual maturity and first breed between three and eight years of age, and the average age of reproductive females is about ten (Pitcher and Calkins 1981; Calkins and Pitcher 1982; York 1994).

After reaching maturity, females normally ovulate and breed annually. There is a high rate of reproductive failure but, when successful, females give birth to a single pup between May and July. The sex ratio of pups at birth is assumed to be about 1:1, or slightly biased toward males. Newborn pups are dependent upon their mother for milk during at least the first three months, and observations suggest they continue to be highly dependent through the first winter (Trites et al. 2006).

4.3.4.5 Vocalization, Hearing, and Other Sensory Capabilities

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2018e). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 and 25 kHz (Kastelein et al. 2005), and in air between 250 Hz and 30 kHz (Mulsow and Reichmuth 2010). Sound signals from vessels are typically within the hearing range of Steller sea lions, whether the animals are in the water or hauled out.

4.3.4.6 Threats

4.3.4.6.1 Natural Threats

Killer whale predation on the Western DPS, under reduced population size, may cause significant reductions in the stock (NMFS 2008b). Steller sea lions are also vulnerable to predation from sleeper sharks. Juvenile Steller sea lions were found to underutilize foraging habitats and prey resources based on predation risk by killer whales and sleeper sharks (Frid et al. 2009).

Steller sea lions have tested positive for several pathogens, and parasites are common; however, disease levels and mortality resulting from infestation are unknown. Significant negative effects of these factors may occur in combination with stress, which may compromise the immune system. If other factors, such as disturbance, injury, or difficulty feeding occur, it is more likely that disease and parasitism can play a greater role in population reduction

The female spawning biomass of Pacific cod, an important prey species for Steller sea lions, was at its lowest point in 2018.[10] The federal Pacific cod fishery in the Gulf of Alaska was closed by regulation to directed Pacific cod fishing in 2020 (Barbeaux, Holsman and Zador 2020), and abundance has remained at reduced levels since the 2014-2016 marine heatwave.[11]

4.3.4.6.2 Anthropogenic Threats

Subsistence hunters removed 209 Western DPS Steller sea lions between 2014 and 2018 in controlled and authorized harvests (Young et al. 2023). Between 2016 and 2020, human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, in particular, commercial trawl gear (n=113; Freed et al. 2022).

Concern also exists regarding competition between commercial fisheries and Steller sea lions for the same resource: stocks of pollock, Pacific cod, and Atka mackerel. Limitations on fishing grounds, duration of fishing season, and monitoring have been established to prevent Steller sea lion nutritional deficiencies as a result of inadequate prey availability. Illegal shooting continues to be a threat to Steller sea lions in certain areas of Alaska.

Metal and contaminant exposure remains a focus of ongoing investigation. Total mercury concentrations measured in hair samples collected from pups in the western-central Aleutian Islands were detected at levels that cause neurological and reproductive effects in other species (Rea et al. 2013).

5 ENVIRONMENTAL BASELINE

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action areas that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR § 402.02).

This section focuses on existing anthropogenic and natural activities within the action area and their influences on the listed species and critical habitat that may be adversely affected by the proposed action. Although some of the activities discussed below occur outside of the action area, they may still impact listed species and/or habitat in the action area.

The majority of Alaska’s population lives in the Municipality of Anchorage and the Matanuska-Susitna Borough. In 2023, 39 percent of the population resided in the Municipality of Anchorage

[10] https://apps-afsc.fisheries.noaa.gov/REFM/Docs/2018/GOA/GOApcod.pdf accessed February 2024.
[11] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2023/GOABrief.pdf accessed February 2024.

and 15 percent were in the Matanuska-Susitna Borough.[12] Anchorage's population is projected to increase by 5 percent and the Matanuska-Susitna Borough population is projected to increase 44 percent between 2019 and 2045.[13] Upper Cook Inlet is exposed to more anthropogenic activities than most other locations in Alaska and there are multiple paths of potential habitat alteration and/or degradation. Marine mammals may be affected by multiple threats concurrently, compounding the impacts of individual threats. Anthropogenic risk factors are discussed individually below.

5.1 Recent Biological Opinions in the Action Area

NMFS AKR has a long history of issuing biological opinions for projects in Cook Inlet. Most of these consultations analyzed stressors that caused harassment rather than harm or mortality. Effects of these Cook Inlet actions (e.g., actions that caused acoustic harassment) on individual marine mammals are not measurable in the years following the action, and are believed to not have affected those marine mammals or their populations in any measurable way in the subsequent years. Some of these actions (e.g., construction of new oil rigs or ship terminals, filling of critical habitat in Turnagain Arm), however, have had broader environmental effects that last many years. Recent biological opinions issued by NMFS AKR for projects in Cook Inlet, include:

- Port of Alaska North Extension Stabilization Step 1 (AKRO-2022-03630), 2023
- Bureau of Ocean Energy Management Lease Sale 258 (AKRO-2022-02861), 2023
- Hilcorp Cook Inlet Tugs Towing a Jack-up Rig (AKRO-2021-03484), 2022
- Port of Alaska South Floating Dock (AKRO-2021-01051), 2021
- Port of Alaska Petroleum and Cement Terminal (AKRO-2018-01332), 2020
- Alaska Liquefied Natural Gas Project (AKRO-2018-01319), Alaska Gasoline Development Corporation, 2020
- U.S. Environmental Protection Agency Proposed Approval of the State of Alaska's Mixing Zone Regulation Section of the State of Alaska's Water Quality Standards (AKRO-2018-00362), 2019
- Hilcorp Alaska and Harvest Alaska Oil and Gas Activities (AKRO-2018-00381), 2019

We discuss these opinions below under headings that group together similar project types.

5.2 Coastal Development

While the majority of the Cook Inlet shoreline is undeveloped, there are municipalities, port facilities, airports, wastewater treatment plants, roads, mixing zones, and railroads that occur along or close to the shoreline. These types of projects are addressed in more detail below.

Beluga whales and Steller sea lions are particularly prone to regular interaction with human

[12] https://live.laborstats.alaska.gov/pop/index.html Accessed March 2024.
[13] https://live.laborstats.alaska.gov/pop/estimates/pub/19popover.pdf Accessed March 2024.

activities due to their frequent use of shallow, nearshore, and estuarine habitats (Perrin 1999). Cook Inlet beluga whales and Western DPS Steller sea lions use nearshore environments to rest, feed, give birth, and breed, and could be affected by coastal development. Fin whales and humpback whales mostly occupy offshore areas and are less likely to be affected by coastal development activities in Cook Inlet.

5.2.1 Road Construction

The Alaska Department of Transportation (ADOT) began Seward Highway improvements from milepost (MP) 75 to 107 (along Turnagain Arm) in 2015. These activities included geophysical and geotechnical testing, on-shore blasting, pile removal and installation at stream crossings, fill placed into Turnagain Arm, and construction of a boat ramp at Windy Point. Activities also included resurfacing 15 miles of roadway, straightening curves, installing new passing lanes and parking areas, and replacing 8 existing bridges along the Seward Highway between MP 75 and 90.

The Seward Highway MP 75 to 90 Bridge Replacement project completed three bridge replacements by the end of 2019 during Phase 1. Phase 2 began in June 2021 with bridge work at Portage Creek #1 and the Placer River. The project reached substantial completion in October 2023. To avoid harassment of Cook Inlet beluga whales during the eulachon run, in-water work, including vibratory and impact pile installation and removal, did not occur from May 15 to June 15, and marine mammal monitoring was required during any work conducted below mean high water.

Consultation on the Seward Highway MP 105-107 Windy Corner project was expected to be completed in 2015; however, the project has been delayed. The project plans to realign a 3.2 km segment of the highway and railroad, and includes land-based blasting and non-impulsive sound from fill placement. A Draft Environmental Assessment was made available to the public in March 2020, and ADOT extended the project north between Windy Corner and Rainbow Point (MP 105-109.5) after reviewing public comments. As of March 2023, the Seward Highway MP 105-109.5 Windy Corner to Rainbow Point project was incorporated into the Seward Highway MP 98.5 to 118 Bird Flats to Rabbit Creek project, also known as the Safer Seward Highway project.[14] Construction will be primarily seasonal and occur over multiple years.

In 2020, NMFS completed consultation for work to remove 40 deteriorating timber piles that once supported the Alaska Railroad bridge over Portage Creek #2. Project activities were restricted by seasonal timing to avoid the peak eulachon and salmon runs, and by daily tidal cycle to minimize potential interaction with belugas. Pile removal provides belugas with unrestricted access to this salmon bearing creek.

5.2.2 Port Facilities

Cook Inlet is home to port facilities at Anchorage, Point Mackenzie, Nikiski, Kenai, Homer, Seldovia, and Port Graham; barge landings occur at Tyonek and Anchor Point. Anchorage has a small boat ramp near Ship Creek, and is the only hardened public access boat ramp in upper

[14] https://safersewardhighway.com/ Accessed March 2024.

Cook Inlet. Numerous other boat launch sites (e.g., beach launch at Tyonek, Captain Cook State Recreation Area, City of Kenai boat launch, multiple boat launch locations near the mouth of the Kenai River, and Kasilof River State Recreation Site) provide small boats access to Cook Inlet.

5.2.2.1 Port of Alaska

The Don Young Port of Alaska (POA) is Alaska's largest seaport. The POA handles half of all Alaska inbound fuel and freight, moving more than four million tons of material across its docks annually, which is distributed statewide and consumed by 90 percent of Alaska's population. Operations began in 1961 with a single berth, and have since expanded to include three cargo terminals, two petroleum terminals, one dry barge berth, two miles of rail-spur connected to Alaska Railroad, and two floating, small-vessel docks, plus 220 acres of land facility located in Anchorage.[15]

The POA Modernization Program (PAMP) is comprised of multiple construction projects to update facilities for operational efficiency, accommodate modern shipping operations, and improve seismic resiliency. The Petroleum and Cement Terminal (PCT) is a pile-supported dock, comprised of an access trestle, loading platform, monopile breasting dolphins, monopile mooring dolphins, and related superstructure; Phase 1 was completed in 2020 and Phase 2 was completed in 2021. Fifty-five Level B harassment takes for Cook Inlet beluga whales were authorized and 26 exposures to sound exceeding the Level B harassment threshold were recorded during Phase 1 (61 North Environmental 2021). During Phase 2 activities, 27 of the 35 authorized Level B harassment takes were recorded (61 North Environmental 2022a).

In 2020 the POA applied for a USACE Nationwide Permit 3, Maintenance for the POA Fender Pile Replacement and Repair Project and NMFS AKR issued a Letter of Concurrence in 2021. The project will replace piles within the existing fendering system; inspections conducted before and after the 2018 Anchorage earthquake indicated the piles are in a state of imminent failure and require repair. The fendering system is comprised of 107 fender assemblies each supported by two pin piles. Twenty-three total fender assemblies were replaced in 2015 and 2019, and the remaining fender assemblies were repaired.

Another component of the PAMP involved relocating the existing South Floating Dock (SFD), which is a relatively small structure used to stage and support small vessels, such as first-responder rescue craft, small work skiffs, and occasionally tugboats, in an area close to the daily operations at the POA. The existing SFD structure was removed and a new dock was constructed in May and June of 2022. Twenty-four Level B harassment takes for Cook Inlet beluga whales were authorized and two exposures to sound exceeding the Level B harassment threshold were recorded.

Construction activities related to the POA PAMP North Extension Stabilization Step 1 project began in May 2024 and are expected to occur until November 2024. The project involves the removal of portions of the failed sheet pile structure to stabilize the North Extension area of the POA. In-water construction will include impact and vibratory pile driving, pile splitting, and pile cutting. Seventy-two Level B harassment takes for Cook Inlet beluga whales were authorized.

[15] https://www.portofalaska.com/about-us/ Accessed March 2024.

The POA submitted an application for a Letter of Authorization to the NMFS Permits Division in October 2023 for construction activities related to the POA PAMP Cargo Docks Replacement project. The project will include impact and vibratory pile driving at the POA over the course of five years, with activities planned between April 1, 2026 and March 31, 2031.

Maintenance dredging at the POA began in 1965, and is an ongoing activity from April through October in most years, affecting about 100 acres of substrate per year. The POA is dredged to the depth of -11 m below mean lower low water (MLLW) and dredged materials are dumped 915 m abeam of the POA dock face at the Anchorage in-water disposal site. To accommodate vessels berthing at the PCT location, transitional dredging to a depth of -12 m MLLW began in 2018, and dredged material was dumped in the offshore disposal area (NMFS 2018c). Dredging at the POA has not been identified as a source of re-suspended contaminants (USACE 2009), and belugas often pass near the dredge (USACE 2008; ICRC 2012; POA 2019; USACE 2019). NMFS continues to analyze data to assess whether belugas react to dredging operations.

Dredging operations also occur annually at the Ship Creek Boat Ramp, located approximately 1.4 km southwest of the POA. Heavy machinery is used to push the accumulated sediment around the boat ramp seaward during three to four days when the area is dewatered. NMFS AKR issued a Letter of Concurrence for Ship Creek dredging in 2020 (AKRO-2020-01277).

5.2.2.2 Port MacKenzie

Port MacKenzie located along western, lower Knik Arm consists of a 152 m bulkhead barge dock, a 366 m deep draft dock with a conveyor system, a landing ramp, and more than 8,000 acres of adjacent uplands. Coastal development began with the construction of the barge dock in 2000 and additional construction and bulkhead repair activity has occurred since then. Current operations may include dry bulk cargo movement and storage, depending on the current state of the port and existing demand for its facilities. Multiple groups of belugas were observed in this area between April and September 2020 and 2021 during monitoring for the POA PCT construction (61 North Environmental 2021; 61 North Environmental 2022a).

5.2.2.3 Other Ports

Nikiski is home to several privately owned docks including the Offshore Systems Kenai dock. Activity at Nikiski includes the shipping and receiving of anhydrous ammonia, dry bulk urea, liquefied natural gas, sulfuric acid, petroleum products, caustic soda, and crude oil. In 2014, the Arctic Slope Regional Corporation expanded and updated its Rig Tenders Dock in Nikiski, in anticipation of increased oil and gas activity.

Ladd Landing Beach, located near Tyonek, serves as public access to the Three Mile subdivision and a staging area for various commercial fishing sites in the area.

5.3 Oil and Gas 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). There may also be unconventional oil and gas accumulations of up to 637 billion cubic feet of gas and 9 million barrels of natural gas liquids (Schenk et al. 2015).

Lease sales for oil and gas development in Cook Inlet began in 1959 (Alaska Department of Natural Resources 2014), and there were attempts at oil exploration along the west side of Cook Inlet prior to that. Fourteen offshore oil production facilities were installed in upper Cook Inlet by the late 1960s, and today there are 17 offshore oil and gas platforms. Figure 12 shows the ongoing oil and gas activities in state waters as of December 2023. There are 200 active oil and gas leases in Cook Inlet that encompass approximately 394,403 acres of State leased land, of which 322,801 acres are offshore (Figure 13).[16]

Approximately 3.3 million acres were up for bid in the state-owned lease sale in June 2021, and HEX Group and Strong Energy Resources successfully bid on nearly 21,000 acres of oil and gas tracts in Cook Inlet. Hilcorp successfully bid on nearly 23,000 acres of oil and gas tracts in the 2022 state-owned lease sale. In the 2023 state-owned lease sale, HEX, LLC successfully bid on 1,674 acres and Hilcorp successfully bid on 13,324 acres.

BOEM held Lease Sale 244 in Cook Inlet in 2017 (NMFS 2017b). Hilcorp was the only responding company and their successful bids on 14 tracts/blocks encompassed 31,005 acres. NMFS issued Incidental Take Regulations for Hilcorp's oil and gas activities (NMFS 2019b); the seismic surveys and other activities are discussed below. Lease Sale 258 in Cook Inlet was cancelled in May 2022 due to lack of industry interest; however, BOEM was directed by the Inflation Reduction Act of 2022 to hold Lease Sale 258 by the end of 2022 (Figure 14). One bid on one block was received and awarded to Hilcorp in March 2023. A court order suspended the lease in July 2024.

5.3.1 Kenai Liquefied Natural Gas Plant

The Kenai liquefied natural gas (LNG) liquefaction and terminal complex began operating in 1969 and, until 2012, was the only facility in the United States authorized to export LNG produced from domestic natural gas. LNG shipments from the terminal began declining and the plant has been in a warm-idle state since 2015. In early 2019, NMFS was informed that there were plans to bring the plant back into operation in the next few years. The Federal Energy Regulatory Commission (FERC) approved the Trans-Foreland Pipeline Company's request to convert the facility to an importing plant in December 2020 and gave the company until December 2022 to place it into service. The Trans-Foreland Company requested an extension to complete the facility by December 2025, which FERC approved in August 2022.[17]

Oil and gas development will likely continue in Cook Inlet; however, the overall effects on listed marine mammals are unknown (NMFS 2008a; NMFS 2008b). 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 2016).

[16] https://dog.dnr.alaska.gov/Documents/Leasing/PeriodicReports/Lease_LASActiveLeaseInventory.pdf Accessed March 2024.
[17] https://www.reuters.com/business/energy/marathon-gets-more-time-build-lng-import-project-alaska-2022-08-16 Accessed March 2024.

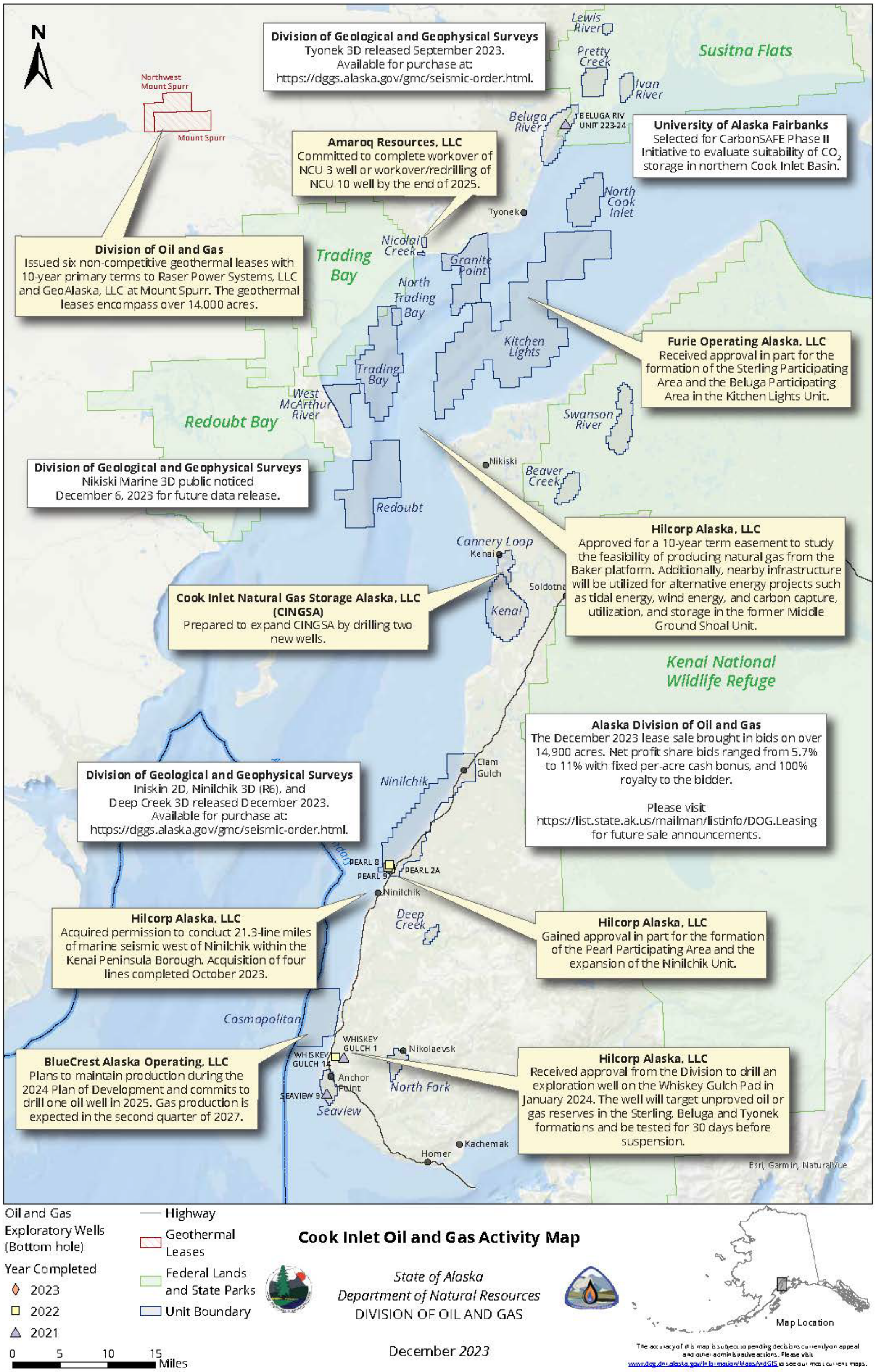

Figure 12. Oil and gas activity in Cook Inlet as of December 2023.

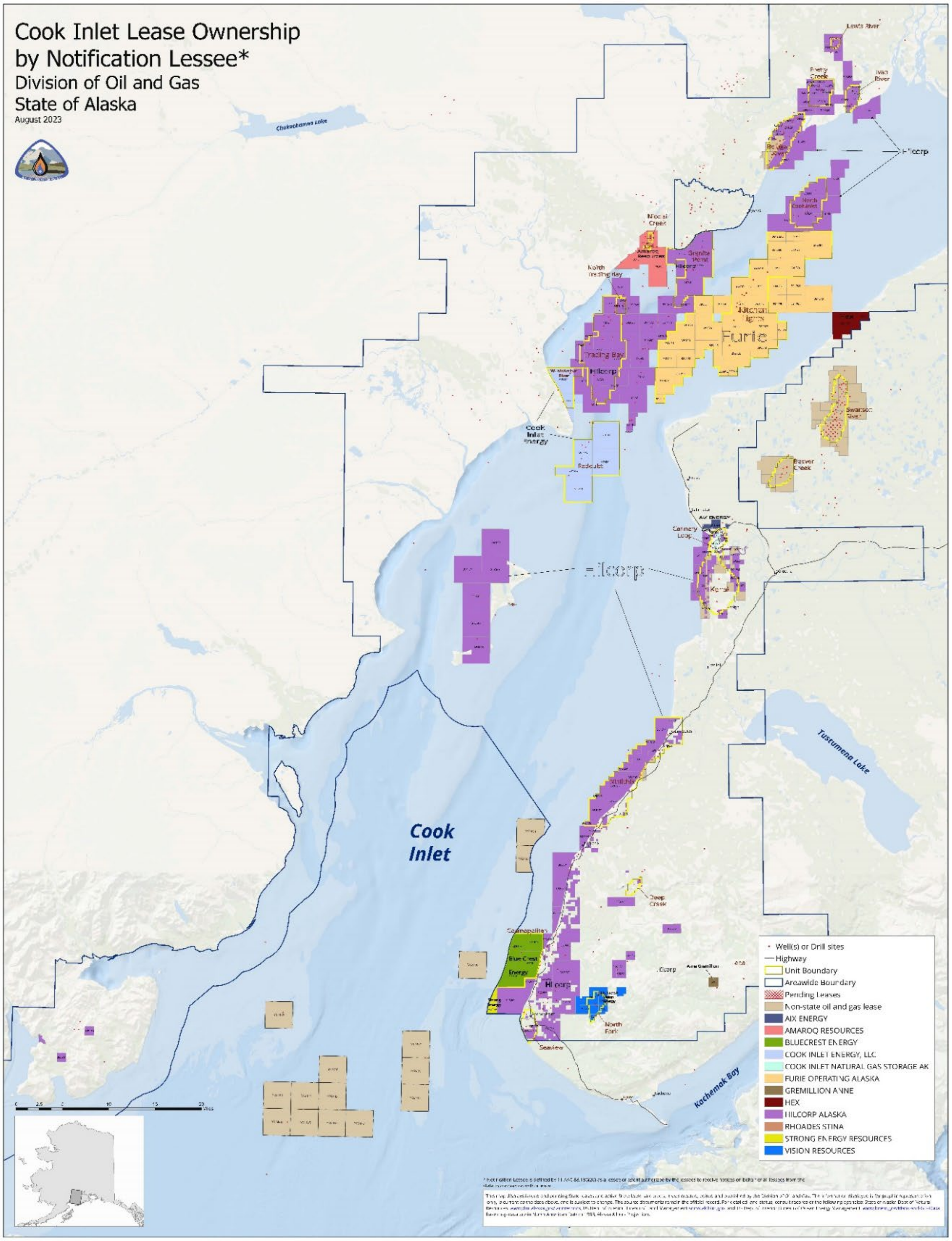

Figure 13. Cook Inlet lease ownership by notification lessee.

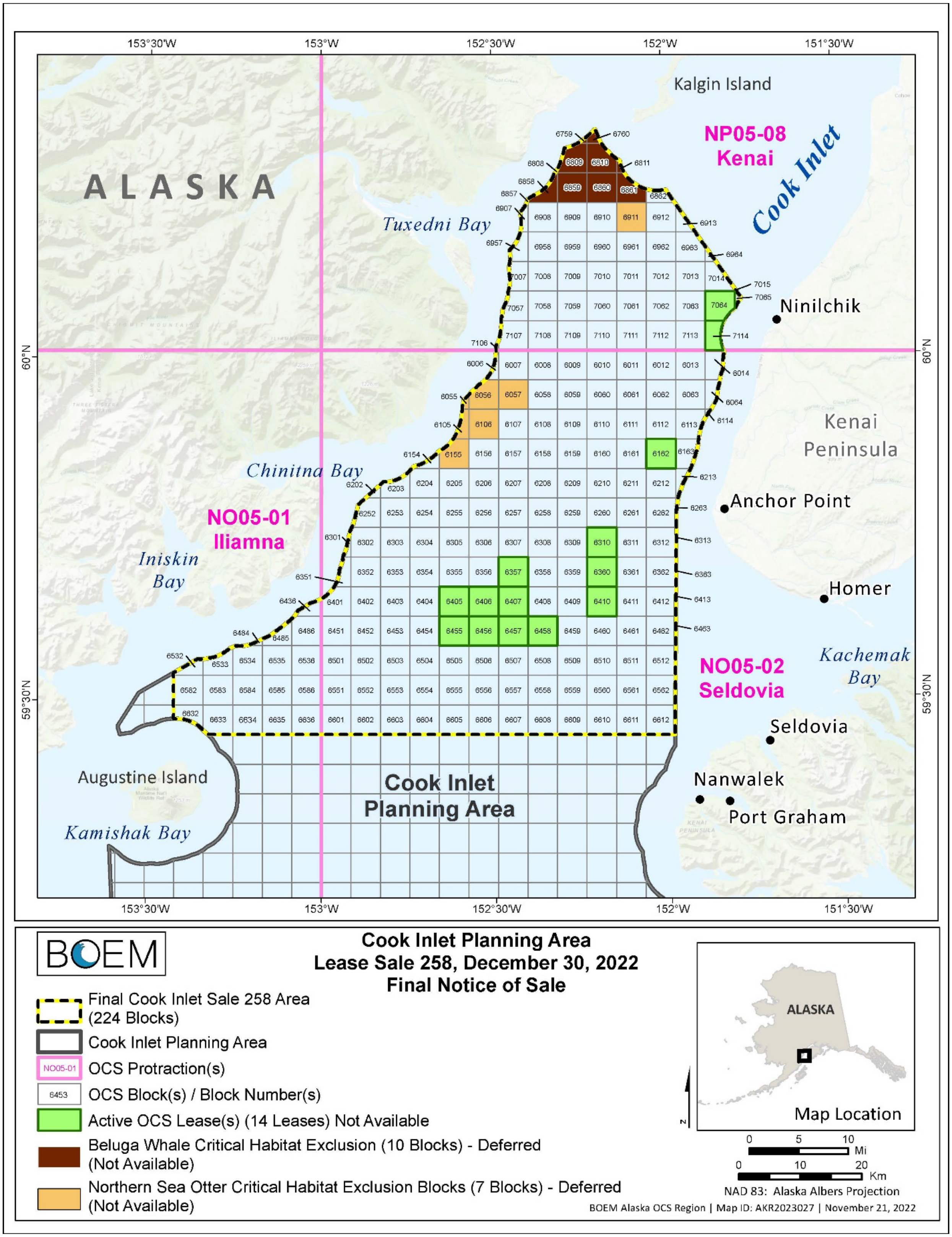

Figure 14. Lease Sale 258 Blocks.

5.4 Underwater Installations

The majority of underwater installations in Cook Inlet are oil and gas pipelines, which are an essential part of oil and gas activities in the area. The Cook Inlet basin is the source for all natural gas used in Southcentral Alaska. Communication cables have also been laid, and a project to harness tidal energy is in the initial stages of development.

Installation of pipelines involves multiple vessels; anchor-handling tugs are used to reposition the anchors of a non-motorized pipe-laying barge, which is used to weld the pipeline that is laid over the back of the barge and into the trench. The tugs rely on their bow-thrusters while repositioning the anchors to keep the barge properly positioned and moving along. These projects involve disturbance to the substrate, increased turbidity in the vicinity of the trenching, and increased sound from the tugboats and pipe-laying equipment.

There is always a possibility of pipeline failures associated with oil and gas development, with resultant oil spills, gas leaks, or other sources of marine petrochemical contamination. Spills and contaminants are discussed below.

5.4.1 Harvest Alaska Cook Inlet Pipeline Cross Inlet Extension (CIPL)

Harvest, Alaska LLC, a subsidiary of Hilcorp Alaska, extended the existing undersea pipeline network in Cook Inlet and connected the Tyonek platform to the land-based pipeline located about 6.4 km north of the village of Tyonek in 2018. The cross-inlet extension included two steel subsea pipelines 25 centimeters (cm) and 20 cm in diameter, and 8.9 km in length. The existing 25 cm subsea pipeline that crosses Cook Inlet between Kaloa Junction and the East Forelands Facility was also converted from natural gas service to oil service. The IHA authorized Level B harassment of 40 Cook Inlet beluga whales, 6 Steller sea lions, and 5 humpback whales (NMFS 2018d). PSOs observed 814 beluga whales, 3 humpback whales, and 2 Steller sea lions during project activities. Of the 819 listed animals observed, only 1 humpback whale was considered exposed to sound exceeding the Level B harassment threshold (Sitkiewicz et al. 2018).

5.4.2 Alaska LNG Project

The Alaska LNG Project proposes to carry natural gas from the North Slope to Southcentral Alaska for export internationally, eventually shipping up to 2.4 billion cubic feet of liquefied natural gas per day. Proposed infrastructure includes an approximately 1,290 km long, large diameter pipeline from the North Slope that would cross Cook Inlet north of the Forelands and terminate at a proposed liquefaction facility in the Nikiski area on the Kenai Peninsula. Five years of construction are anticipated for the Cook Inlet portion of the project. ESA consultation was completed in June 2020; the project is expected to result in Level B harassment of 61 Cook Inlet beluga whales, and 1 Mexico and 1 WNP DPS humpback whale over the five years of work. One Mexico DPS humpback whale may also be exposed to sound levels exceeding the injury threshold. As of yet, there is no planned project start date for the project and no construction has occurred.

5.4.3 Tidal Energy

Ocean Renewable Power Company (ORPC), a developer of renewable power systems that harness energy from free-flowing rivers and tidal currents, submitted a preliminary permit application to FERC in May 2021 for a project in Cook Inlet. ORPC previously conducted site characterization and environmental studies in the region, and intends to develop a five-megawatt pilot project near East Foreland to verify the technical performance and environmental compatibility of its proposed project. Project results will assist in planning a phased build-out of up to a 100-megawatt commercial-scale project.[18] ORPC will collaborate with Homer Electric Association, Inc. to sell the tidal energy produced. Work on this project has not begun, nor have proposed construction dates been conveyed to NMFS.

ORPC is also partnering with the Matanuska-Susitna Borough to test its RivGen Power System at Port MacKenzie.[19] They plan to evaluate the ability to harness the tidal current of upper Knik Arm to power the cathodic protection systems, which prevent the metal structures from corroding, at the port.

5.5 Natural and Anthropogenic Sound

Because sound is a primary source of disturbance to marine mammals, this opinion considers it as a separate category of the Environmental Baseline, although it is generally attributable to other factors in the baseline, such as coastal and off-shore development.

Underwater sound in Cook Inlet is categorized as physical sound, biological sound, and human-caused sound. Natural physical sound originates from wind, waves at the surface, currents, earthquakes, ice movement, tidal currents, and atmospheric sound (Richardson et al. 1995). Tidal influences in Cook Inlet are a predominant contributor of physical sound to the acoustic environment (Burgess 2014; BOEM 2016).

Biological sound includes sounds produced by marine mammals (particularly whales and dolphins, but also pinnipeds), fish (Maruska and Mensinger 2009), and invertebrates (Chitre, Ong and Potter 2005). Human-caused sound includes vessel motor sounds, oil and gas operations, maintenance dredging, aircraft overflights, construction noise, and infrastructure maintenance noise. Much of upper Cook Inlet is a poor acoustic propagation environment due to shallow depths and sand and mud bottoms.

5.5.1 Seismic Surveys in Cook Inlet

Cook Inlet has a long history of oil and gas activities including seismic exploration, geophysical and geological surveys, exploratory drilling, increased vessel and air traffic, and platform production operations. Seismic surveys use high energy, low frequency sound in short pulse durations to characterize subsurface geology, often to determine the location of oil and gas reserves. Geophysical seismic activity has the potential to harass or harm marine mammals

[18] https://www.renewableenergymagazine.com/ocean_energy/orpc-plans-to-advance-tidal-energy-in-20210526 Accessed April 2024.
[19] https://www.akbizmag.com/industry/energy/testing-tidal-power-in-knik-arm/ Accessed April 2024.

(Nowacek et al. 2015).

Large airgun arrays of greater than 3,000 in^3, which can produce sound source levels exceeding 240 dB re 1 µPa rms, were previously used for seismic exploration in Cook Inlet. Smaller arrays are now being used because of the generally shallow water environment and the increased use of ocean-bottom cable and ocean-bottom node technology (Boman 2012). Shallow water surveys have employed 440, 620, and 880 in^3 arrays with source sound pressure levels less than 230 dB re 1 µPa rms. Measured radii to the 160 dB harassment isopleths have ranged from 3 to 9.5 km.

5.5.1.1 Apache Seismic Exploration

Apache Alaska Corporation conducted over 1,800 hours of seismic activity in 2012 and reported zero takes of beluga whales and Steller sea lions; however, observations of protected marine mammals within ensonified zones prior to equipment power-down or shutdown occurred on numerous occasions (Lomac-MacNair, Kendall and Wisdom 2013).

In 2014, observers recorded takes of 12 beluga whales and two humpback whales during 3,029 hours of observation effort. Additionally, four beluga whale groups were recorded less than 500 m from the source vessel during seismic operations (Lomac-MacNair, Thissen and Smultea 2014). The monitoring report is ambiguous, and it is unclear if the seismic guns were firing during those sightings. If the airgun array was operating, the groups were exposed to sounds exceeding the Level A injury threshold. A humpback whale was observed 1.5 km from the sound source when the airgun array was at full volume. Seismic operations were shut down immediately; however, it is estimated that the whale was exposed to at least 19 shots exceeding the Level A injury threshold. Regardless of immediate power-down or shutdown actions, an animal is considered exposed if it is within the respective Level A or Level B isopleths while sound is occurring.

5.5.1.2 SAE 3D Seismic Exploration

Eight vessels were deployed during SAE seismic operations in upper Cook Inlet in 2015. Of the total number of visual observations and acoustic detections, 194 animals were exposed to sounds exceeding the harassment threshold and 13 animals were exposed to sounds exceeding the injury threshold (Kendall et al. 2015). Species exposed to sounds exceeding the harassment threshold included an unidentified large cetacean, two belugas, and a Steller sea lion. A Steller sea lion was also exposed to sounds exceeding the injury threshold. Mitigation measures (clearance, ramp-up, and shut down procedures) prevented take during an additional 70 sightings (Kendall et al. 2015).

5.5.1.3 Hilcorp 3D Seismic

Hilcorp conducted a 3D seismic survey of approximately 790 km^2 over 8 outer continental shelf lease blocks in Lower Cook Inlet in 2019. One source, two support, and one marine mammal mitigation vessel were deployed. A Steller sea lion and a fin whale were observed in the Level A zone during seismic activity; however, permanent threshold shift or Level A take was unlikely because shut downs were implemented within a one-shot period. Level A injury thresholds are calculated with the assumption that an animal remains within the zone for 24 hours before an animal has a permanent threshold shift. Based on actual observed take and extrapolated estimates of take based on those observations, 10.9 fin whales, 31.5 humpback whales, and 4.9 Steller sea lions were exposed to sounds exceeding the Level B harassment threshold during the project (Fairweather Science 2020).

5.5.2 Military Detonations

NMFS consulted on winter live-fire weapons training on the Eagle River Flats (ERF) Impact Area at Joint Base Elmendorf-Richardson (JBER) in 2016. Live-fire training uses firing positions on a designated range facility, at predetermined targets, in a controlled access area known as an impact area. ERF has been used as a dudded impact area since about 1945. A dudded impact area is an area having designated boundaries within which all dud producing ordnance will detonate on impact. This area may include vehicle bodies that serve as targets for artillery/mortar direct and indirect fire. The current winter-only firing restriction have been in place since 1991.

Cook Inlet beluga whales may be able to hear sounds from JBER while they are in coastal waters near the firing range; however, NMFS determined that low frequency impulses from exploding ordnance are not expected to cause noise levels of concern. Adverse effects are extremely unlikely because belugas are not expected to be present in the winter when firing occurs, no measurable effects on their prey base are expected, and mitigation measures are in place to further lessen the chances of any take by harassment. JBER measured the acoustic propagation and developed buffer zones to ensure sound that reaches Eagle Bay falls below 160 dB_{rms} re 1μPa, the Level B take threshold for non-continuous sound for cetaceans. NMFS concluded that acoustic effects on belugas associated with the action were discountable.

5.5.3 Oil and Gas Exploration, Drilling, and Production Noise

With frequencies generally below 10 kHz, operating sounds from the oil platforms themselves are louder than the sound generated by drilling. Noise from the platforms is thought to be weak due to the small surface area (the four legs) in contact with the water (Richardson et al. 1995), and that the majority of the machinery is above the water surface on the deck of the platforms. Blackwell and Greene (2003) recorded underwater sound produced at Phillips A oil platform (now the Tyonek platform) at distances ranging from 0.3 to 19 km from the source. The highest recorded sound level was 119 dB at a distance of 1.2 km. Sound between 2 and 10 kHz was measured as high as 85 dB as far out as 19 km from the source. This noise is audible to listed species.

5.5.3.1 ExxonMobil Alaska LNG, LCC

In 2016, ExxonMobil Alaska conducted geophysical and geotechnical surveys in upper Cook Inlet within the Susitna Delta Exclusion Zone (SUDEX). Two sightings of beluga whales (four individuals total) and one sighting of a harbor seal were observed within the SUDEX. The sightings occurred during non-operational periods (e.g., when no vibracore operations were occurring), and both beluga sightings were observed outside of the harassment zone (Smultea Environmental Sciences 2016).

5.5.3.2 Furie Operating Alaska Exploration Drilling

NMFS completed formal consultation in 2017 for Furie Operating Alaska (Furie) to conduct oil and gas exploratory drilling operations in the Kitchen Lights Unit in upper Cook Inlet between 2017 and 2021 (NMFS 2017a). Actions included tugs towing a jack-up rig from winter storage in lower Cook Inlet to the drilling sites, high-resolution geophysical surveys, pile driving at the drilling locations, drilling operations, vessel and air traffic associated with rig operations, fuel storage, and well completion activities. Furie did not conduct exploratory drilling in 2017 and requested reinitiation in late 2017 after modifying the proposed actions. NMFS completed an informal consultation on the updated action, concurring that the action was not likely to adversely affect listed species or critical habitat, and no take was authorized (NMFS 2018b). PSOs monitored during pile driving in June 2018 and observed one beluga carcass unrelated to project activities (Jacobs Engineering Group 2019). The Kitchen Lights Unit was purchased by HEX, LLC at a December 2019 bankruptcy auction.

Furie submitted an application for two IHAs to the NMFS Permits Division in July 2023 for oil and gas exploration, development, and production activities in Cook Inlet from April 1, 2024 to November 15, 2025. The application includes production drilling at existing platforms in middle Cook Inlet using a jack-up rig towed by tugs. Furie plans to drill one new grassroots well in one of the two well slots in which a conductor pipe is expected to be installed via pile driving in Year 1 and plans to drill one sidetrack well in Year 2.

5.5.3.3 Hilcorp Oil and Gas

The Hilcorp Incidental Take Regulations issued in 2019 included oil and gas exploration, development, production, and decommissioning activities in Cook Inlet between 2019 and 2024. As discussed above, Hilcorp completed seismic operations in 2019. Hilcorp completed routine pipeline maintenance operations in 2020 and did not observe any marine mammals. In 2021, three tugs transported the *Spartan 151* jack-up rig for plug and abandonment activities and production drilling. Hilcorp also completed a shallow hazard survey over lower Cook Inlet Outer Continental Shelf leases in 2021 to evaluate potential hazards, document any potential cultural resources, identify shallow hazards, obtain engineering data for placement of structures, and detect subsurface geologic hazards.

Hilcorp transported the jack-up rig from the Rig Tender’s Dock in Nikiski to the Tyonek platform in middle Cook Inlet in June 2022 and back to the dock in September 2022. In 2023, Hilcorp transported the jack-up rig from the Rig Tender’s Dock to the subsea Well Site 17589 in June, to the Tyonek platform in July, and back to the dock in November.

Hilcorp and Harvest also received a Letter of Concurrence from NMFS AKR in 2022 for routine oil and gas pipeline and infrastructure maintenance. Routine maintenance activities include: subsea pipeline inspections, pipeline stabilization, and repair and replacement; platform leg inspections and repairs; and, anode sled installations. Work under the informal consultation will occur over a five-year period from 2022 – 2027.

5.5.4 Vessel Noise

Cook Inlet is a regional hub of marine transportation throughout the year, and is used by various classes of vessels, including containerships, bulk cargo freighters, tankers, commercial and sport-fishing vessels, and recreational vessels. Vessel traffic density is concentrated along the eastern margin of the Inlet between the southern end of the Kenai Peninsula north to Anchorage. Vessel traffic in Cook Inlet transits through the ports of Homer and Anchorage. Kachemak Bay, near Homer, typically has high levels of larger vessel traffic that enter the mouth of the bay to pick up a marine pilot or await U.S. Coast Guard inspection. The Bay also acts as a port of refuge for vessels sheltering from weather. Before the Drift River Terminal was decommissioned, a substantial source of tanker traffic transported oil from the terminal on the west side of Cook Inlet to the refineries on the east side.

Blackwell and Greene (2003) recorded underwater sound produced by both large and small vessels near the POA. The tugboat *Leo* produced the highest broadband levels of 149 dB re: 1 µPa at a distance of approximately 100 m, while the docked cargo freight ship *Northern Lights* produced the lowest broadband levels of 126 dB re: 1 µPa at 100 to 400 m. Continuous sound from ships generally exceeds 120 dB re 1 µPa rms to distances between 500 and 2,000 m (Jacobs Engineering Group 2017).

Cook Inlet belugas may be affected by the sounds associated with shipping and transportation. There are anecdotal reports of Cook Inlet belugas having varying reactions to vessel traffic; observers recorded diving, direction changes, and groups splitting when vessels and whales crossed paths in close proximity (HDR 2015 unpublished data). During other observations, beluga behavior suggested no reactions and possible habituation to the vessels. Blackwell and Greene (2003) speculated belugas may habituate and become tolerant of vessels in areas subjected to perennial boat traffic.

Belugas may also decrease or cease vocalizations in response to sounds from ships and other activities, or their vocalizations may be masked (Castellote et al. 2016b; Castellote et al. 2018). Scheifele et al. (2005) found that shipping noise caused belugas to vocalize louder. Lesage et al. (1999) described more persistent vocal responses when whales were exposed to a ferry as opposed to a small-boat, including a progressive reduction in calling rate while vessels were approaching, an increase in the repetition of specific calls, and a shift to higher frequency bands when vessels were close to the whales. Brewer et al. (2023) found that the most common call types of Cook Inlet belugas were partially masked by distant commercial ship noise and completely masked by close commercial ship noise in the frequency range up to 12 kHz. Belugas altering their vocal behavior is indicative of an increase in energy costs, and long-term adverse energetic consequences could occur, if noise exposure is chronic. The degradation of the beluga acoustic communication and echolocation space, as well as the noise-induced chronic increase of signaling costs and stress, could lead to negative biological consequences at the population level (NMFS 2016).

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, suggesting an energetic cost to the affected animal. Humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached, as compared to undisturbed whales (Morete et al. 2007). Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986).

Potential impacts of vessel disturbance on Steller sea lions have not been well studied, and the responses likely depend on the season and stage in the reproductive cycle (NMFS 2008b). Steller sea lions are more likely to be disturbed at haulouts and near rookeries, where in-air vessel noise or visual presence could cause behavioral responses such as avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups (Calkins and Pitcher 1982; Kucey 2005). Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008b). Increases in ambient noise from vessel traffic, however temporary, also have the potential to mask communication between sea lions and affect their ability to detect predators (Richardson and Malme 1993; Weilgart 2007).

5.5.5 Aircraft Noise

There is significant air traffic over Cook Inlet. Ted Stevens Anchorage International Airport, located adjacent to lower Knik Arm, is the largest air cargo hub in the U.S. and also has high volumes of commercial air traffic. JBER has a runway near Knik Arm and airspace directly over it. Lake Hood in Anchorage is the largest and busiest seaplane base in the world, and the only seaplane base in the U.S. with primary airport status (Federal Aviation Administration 2016). Small public runways are located in Birchwood, Goose Bay, Merrill Field, Girdwood, Kenai, Ninilchik, Homer, and Seldovia. Oil and gas operators frequently utilize helicopters and fixed-winged aircraft to transport personnel and goods, as well as for surveys.

Airborne sounds do not transfer well to water; much of the sound is attenuated at the surface or reflected where angles of incidence are greater than 13°. However, loud aircraft sound can be heard underwater when aircraft are within or near the 13° overhead cone and surface conditions are calm (Richardson et al. 1995). Castellote et al. (2018) found that belugas can hear jet aircraft noise (commercial, fighter, and non-fighter military jets), which has the potential to mask hearing and communication signals. These noise events are typically of very short duration (seconds) and sporadic, and were determined unlikely to negatively impact Cook Inlet belugas. The sound and visual presence of aircraft may result in behavioral changes though, including diving, altering course, vigorous swimming, and breaching (Patenaude et al. 2002).

NMFS consulted on a proposed action to improve F-22 aircraft operational efficiency at JBER in 2016. The Air Force modeled the in-water sound pressure level of an F-22 overflight and determined the maximum predicted in-water sound was 136.8 dB re 1 μPa rms for a duration of a few seconds. The estimated total time per flight event in flight configurations that result in underwater sound levels greater than 120 dB re 1 μParms was between 3 and 136 seconds, with the number of seconds depending on the flight procedure being conducted. Due to the airspeed of the F-22, at any given point within the overflown portion of Cook Inlet waters, exposures to underwater sound levels greater than 120 dB re 1 μParms would be very brief—approximately 2 to 5 seconds. The number of beluga behavioral reactions associated with the proposed action was estimated at 0.012 to 0.047 per year. Based on the short time during which any increased noise would be detectable to belugas, and the low probability of belugas occurring within the path of maximum sound pressure level, NMFS concluded that acoustic effects on belugas associated with the proposed action were insignificant and discountable.

Observers reported little or no change in swimming direction of beluga whales in Cook Inlet in response to the survey aircraft flying at approximately 244 m (Rugh, Shelden and Mahoney 2000). Beluga whales in the Beaufort Sea were observed diving or swimming away when low-flying aircraft passed above (500 m; Richardson et al. 1995). Individual responses of belugas may vary depending on previous experiences, beluga activity at the time of the sound, and sound characteristics.

The responsiveness of baleen whales (i.e., fin and humpbacks) to aircraft is also variable and may depend on behavioral state, habitat, and age class of the animal. Responses include diving and turning, as well as other changes in behavior. Whales actively engaged in feeding or social behavior often appear less sensitive, and typically do not exhibit a reaction. Whales with calves or in confined waters may be more sensitive. Single or occasional aircraft overflights do not seem to cause long-term displacement or abandonment by whales (Richardson et al. 1995).

Aircraft may also disturb Steller sea lions, especially if hauled out. Disturbance of a rookery or haulout has the potential to result in serious injury or death, predominantly from trampling. Over 1,000 sea lions were observed stampeding off a beach in response to a large helicopter over a mile away (Withrow 1982). There are no major rookeries or haulouts within Cook Inlet.

5.6 Sound and Habitat

A wide variety of anthropogenic sound sources are present in and around Cook Inlet beluga whale habitat. Anthropogenic sound occurs year-round; however, many of the sources are seasonal and only present during the ice-free months. Sound sources include tugs, tankers, cargo ships, fishing vessels, small recreational vessels, dredging, pile-driving, military detonations, and seismic surveys (NMFS 2016).

The limited scientific literature on the effects of sound on fish indicates that sound can evoke a variety of responses. Pile driving can induce a startle and/or avoidance response, and can cause injury or death to fish close to the sound source (McCauley, Fewtrell and Popper 2003; Slabbekoorn et al. 2010; Casper et al. 2012; Halvorsen et al. 2012). Fish will likely avoid sound sources within ranges that may be harmful (McCauley, Fewtrell and Popper 2003).

Coho salmon (*Oncorhynchus kisutch*), a Cook Inlet beluga and Steller sea lion prey species, were exposed to pile driving sound in a laboratory environment (Casper et al. 2012; Halvorsen et al. 2012). Very high sound level exposures (210 dB re 1μPa_{rms}) were required to meet the threshold for onset of injury, suggesting that one or two mild injuries resulting from pile driving exposure at these or higher levels were unlikely to affect the survival of the exposed animals. Rodkin (2009) studied the effects of pile driving sheet piles on juvenile coho salmon at the POA. The fish were exposed to in-situ sound from vibratory or impact pile driving at distances ranging from less than one to over 30 m. There was no mortality of any test fish within 48 hours of exposure to the pile driving activities, and subsequent necropsies found no effects or injuries. The effects of sound on other prey species, such as eulachon, gadids, and flounder species, are unknown (NMFS 2008b; NMFS 2016).

5.7 Water Quality and Water Pollution

The Cook Inlet region is the most populated and industrialized region of Alaska. Its waters receive various pollutant loads through activities that include urban runoff, oil and gas activities, municipal sewage treatment effluents, oil and other chemical spills, fish processing, and other regulated discharges. The main sources of pollutants likely include the 10 wastewater treatment facilities, stormwater runoff, airport de-icing, military training at Eagle Bay, and discharge from oil and gas development (Moore et al. 2000; NMFS 2008a). Emerging pollutants of concern from municipal sewage include endocrine disruptors (substances that interfere with the functions of hormones), pharmaceuticals, personal care products, prions (infectious proteins that cause neurodegenerative disease), and other bacterial and viral agents that are found in wastewater and biosolids (NMFS 2016). Many pollutants are regulated by the Environmental Protection Agency (EPA) or the Alaska Department of Environmental Conservation (ADEC), who may authorize certain discharges under the National (or Alaska) Pollution Discharge Elimination System (NPDES/APDES; section 402 of the Clean Water Act of 1972).

Cook Inlet beluga whales are exposed to chemical concentrations that are typically lower than those experienced by other Arctic marine mammals (Becker et al. 2000; Becker et al. 2010). Levels of heavy metals, pesticides, petroleum hydrocarbons, and polychlorinated biphenyl (PCB) compounds found in Cook Inlet's water column and sediments were below detection limits, and heavy metal concentrations were below management levels when tested (KABATA 2004; NMFS 2008a; USACE 2008). The comparatively low levels of contaminants documented in the Cook Inlet water and sediment samples, as well as in the belugas themselves suggests that the magnitude of the pollution threat appears low.

5.7.1 Petrochemical Spills

According to the ADEC, oil spills in marine waters consist mostly of harbor and vessel spills, and spills from platform and processing facilities. A spill baseline study conducted as part of the Cook Inlet Risk Assessment estimated a historical vessel spill rate of 3.4 spills (regardless of size) per year, with rates ranging from 0.7 spills per year for tank ships to 1.3 spills per year for non-tank/non-workboat vessels (Nuka Research and Planning and Pearson Consulting LLC 2015). Between 1966 and 2015, eight large vessel spills (≥ 1,000 barrels) were documented in Cook Inlet (BOEM 2016). The ADEC Statewide Oil Spills Database[20] provides public access to data on all the spills reported in Cook Inlet or in tributaries to Cook Inlet. The types of spills recorded include jet fuel, crude oil, ethylene glycol, and produced water. Spills of as little as one gallon are reported and most spills are contained and disposed of properly. Two spills have been recorded so far in 2024, 33 in 2023, 14 in 2022, 21 in 2021, and 12 in 2020.

A natural gas leak was discovered in an eight-inch subsea pipeline belonging to Hilcorp in February 2017. The leak, caused by a large rock, began in late December 2016 and permanent

[20] https://dec.alaska.gov/Applications/SPAR/PublicMVC/PERP/SpillSearch Accessed April 2024.

repair was completed by mid-May 2017. The initial estimated leak rate was between 225,000 to 325,000 cubic feet per day. In early April 2021, the same pipeline was discovered to be leaking again. Prior to the line being shutdown, 175,000 pounds of natural gas were released into Cook Inlet.

Given the amount of oil and gas production and vessel traffic, spills of petroleum products are a threat to marine mammals inhabiting Cook Inlet. Oil spills that occur in or upstream of Cook Inlet could result in marine mammals having direct contact with the oil, which could affect the skin and/or respiratory systems. Research indicates cetaceans are capable of detecting oil, but they do not seem to avoid it (Geraci and St. Aubin 1990), and oil has been implicated in the deaths of pinnipeds, including Steller sea lions (St. Aubin 1990).

Cook Inlet beluga whales could be affected through residual oil from a spill, even if they were not present during the oil spill, due to the highly mobile nature of oil in water and the extreme tidal fluctuations in Cook Inlet (NMFS 2008a). Prey contamination is also likely, but the effect of contaminated prey on belugas remains unknown. Polycyclic aromatic hydrocarbons (PAHs), a group of contaminants found in petroleum products, combined with other contaminants, may cause cancer in beluga whales (Kingsley 2002). Cook Inlet belugas appear to be bioaccumulating PAHs from the environment and prey (Norman et al. 2015). Spill clean-up efforts could also result in displacement of whales from essential feeding areas.

Pinnipeds exposed to oil at sea through incidental ingestion, inhalation, or limited surface contact do not appear greatly harmed by the oil; however, pinnipeds found close to the source or who must emerge directly in oil appear substantially more affected. Sea lions exposed to oil through inhalation, dermal contact and absorption, direct ingestion, or through the ingestion of prey may become heavily contaminated with PAHs. Toxic substances, such as oil, may be a contributing factor in the decline of the Western DPS Steller sea lion population (NMFS 2008b). While the Exxon Valdez oil spill occurred after the current Steller sea lion population decline began, the spill almost certainly exacerbated the decline. Mortalities from toxic contamination are strongly linked to this spill; 12 sea lion carcasses were found in Prince William Sound and 16 carcasses were found near Prince William Sound, along the Kenai coast and at the Barren Islands. Elevated PAH levels were present in the animals found dead shortly after the spill (NMFS 2008b).

It is not known whether fin or humpback whales avoid oil spills; however, humpbacks were observed feeding in a small oil spill on Georges Bank (NMFS 1991). The greatest impacts of oil spills on baleen whales could occur indirectly. Local depletion of food resources may occur as a result of displacement and mortality of their food resources, many of which are highly susceptible to the toxic effects of oil and are essentially unable to move away from the site of a spill. Other, more mobile, prey species may suffer from mortality of eggs and immature life stages (NMFS 1991), possibly reducing future availability of prey.

An oil spill in Cook Inlet could also result in widespread habitat degradation, impacting beluga whales and putting the population at risk. Population level effects to fin whales, listed humpback whales, and Western DPS of Steller sea lions within Cook Inlet would be far less likely; however, individual animals may also be put at risk from a spill.

The amount of oil and gas development and vessel traffic in and around Cook Inlet suggests that spills are inevitable. As a consequence, marine mammals and their prey may be exposed to a range of contaminants in varying concentrations. The long-term consequences of this exposure remain unknown. However, the statistical probability of large, and especially very large, oil spills occurring is very small (BOEM 2016). A number of regulatory changes have been put in place since the Deepwater Horizon oil spill in an effort to reduce the risk of spills associated with oil and gas development and production activities (e.g., prescriptive and performance based regulations and guidance, as well as OCS safety and environmental protection requirements; BOEM 2012). Small spills are expected to rapidly disperse due to tide-induced turbulence and mixing; large condensate and diesel fuel spills in Cook Inlet are expected to evaporate and disperse, generally within one to ten days, depending on size of spill (BOEM 2017).

5.7.2 Wastewater Discharge

Wastewaters entering treatment facilities may contain a variety of organic and inorganic pollutants, metals, nutrients, sediments, bacteria and viruses, and other emerging pollutants of concern; and, undergo primary, secondary, or tertiary treatment prior to being discharged into a body of water. Primary treatment involves sedimentation. In general, this includes removing 50 to 70 percent of the solid particulate from the wastewater prior to discharge (Sonune and Ghate 2004). Secondary treatment involves adding a biological component to remove the remaining organic matter. Tertiary treatment involves both primary and secondary treatment as well as additional processes to increase the water quality of the discharge (Sonune and Ghate 2004).

Ten communities currently discharge treated municipal wastes into Cook Inlet. Wastewater from the Municipality of Anchorage, Nanwalek, Port Graham, Seldovia, and Tyonek receive primary treatment, wastewaters from Homer, Kenai, and Palmer receive secondary treatment, and wastewaters from Eagle River and Girdwood receive tertiary treatment.

The Anchorage John M. Asplund Wastewater Treatment Facility (AWTF) is the largest wastewater facility in Alaska and is located in upper Cook Inlet. AWTF provides primary treatment, and removes approximately 80 percent of solids prior to discharge. The facility was built in 1972, upgraded in 1982 and again in 1989. The Environmental Protection Agency (EPA) issues AWTF a waiver for secondary treatment because of the levels of sediment they are able to extract and the extreme tides and currents of Cook Inlet (Kinnetic Laboratories Incorporated 2017). Once the sediment is removed from the wastewater, the sludge is incinerated. The effluent is tested regularly, including bioassays on fish and invertebrates, and has shown very low levels of contaminants (Jokela et al. 2010).

The Village of Tyonek wastewater treatment facility operates on a gravity fed sewer that drains into a community septic tank. The solids are transferred to a sludge lagoon for dewatering twice a year and the liquid effluent is then discharged into Cook Inlet near an area heavily used by feeding Cook Inlet beluga whales. The City of Kenai wastewater facility is one of the larger plants and is located near the largest runs of salmon in Cook Inlet. Secondary-treated wastewater is discharged directly into Cook Inlet, and the sludge is taken to the Soldotna landfill.

Wastewater discharge from oil and gas development could also increase pollutants in Cook Inlet (NMFS 2008a.) Discharge includes, but is not limited to, drilling fluids (muds and cuttings), produced water (water phase of liquid pumped from oil wells), and domestic and sanitary waste

(NMFS 2008a; EPA 2015). Oil and gas facilities are required to monitor effluent for pollutants and meet specific standards stipulated in their EPA-issued NPDES permit before wastewater is discharged into Cook Inlet (EPA 2015).

5.7.3 Mixing Zones

In 2010, the EPA consulted with NMFS on the approval of ADEC's Mixing Zone Regulation section (18 AAC 70.240), including the most recent revisions of the Alaska Water Quality Standards (18 AAC 70; WQS), relative to the endangered Cook Inlet beluga whale (NMFS 2010b). The biological opinion concluded that there was insufficient information to determine whether belugas could be harmed by the elevated concentrations of substances present in mixing zones, but that the action was not likely to jeopardize the continued existence of the species. In 2019, NMFS issued a biological opinion on the effects of EPA approval of the Mixing Zone Regulation following designation of Cook Inlet beluga whale critical habitat and concluded that the Mixing Zone Regulation is not likely to destroy or adversely modify designated Cook Inlet beluga whale critical habitat.

5.7.4 Stormwater Runoff

Stormwater pollutants may include street and aircraft de-icer, oil, pesticides and fertilizers, heavy metals, and fecal coliform bacteria. Public Works and the Alaska Department of Transportation and Public Facilities are responsible for identifying, monitoring, and controlling pollutants in stormwater. The effects of stormwater on the Cook Inlet beluga whale have not been studied and are unknown (NMFS 2008a).

Numerous releases of petroleum hydrocarbons have been documented from the POA, JBER, and the Alaska Railroad Corporation (ARRC). The POA transfers and stores petroleum oils, as well as other hazardous materials. Since 1992, all significant spills and leaks have been reported. Past spills have been documented at each of the bulk fuel facilities within the POA and also on JBER's property (POA 2003). JBER is listed on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 because of known or threatened releases of hazardous substances, pollutants, or contaminants. Spills have also been reported at the ARRC rail yard. In 1986, petroleum seeped into Ship Creek from the nearby rail yard, and several oil spills occurred in 2001 (U. S. Army 2010). Freight handling activities have historically caused numerous surface stains and spills at the rail yard.

5.7.5 Aircraft De-icing

The Federal Aviation Administration requires de-icing and anti-icing of aircraft and airfield surfaces, when necessary, to ensure passenger safety. De-icing and anti-icing chemicals are used from October through May and may be used on aircraft, tarmacs, and runways. De-icing material is comprised of different chemicals depending on the application; ethylene glycol and propylene glycol are used on aircraft for anti-icing and de-icing purposes, whereas potassium acetate is used to de-ice tarmacs and runways.

The Ted Stevens Anchorage International Airport and Joint Base Elmendorf-Richardson airport are the largest airports in the Cook Inlet region. Other smaller airports exist throughout the Cook

Inlet watershed, including Merrill Field, Lake Hood, Kenai, and Homer (NMFS 2008a). It is likely that they all regularly contribute pollutants to Cook Inlet through stormwater runoff; one of the stormwater outfalls from the Ted Stevens Anchorage International Airport enters Knik Arm directly. After receiving complaints from the public, ADEC conducted inspections of the outfall that discharges into Knik Arm in April 2009, May 2012, and April 2017 (ADEC 2019). De-icing chemicals were detected and a Notice of Violation was recorded in all three years (ADEC 2019).

The current permit for the Ted Stevens Anchorage International Airport requires monthly sampling and reporting of several water quality standards, and an annual report for the outfall entering Knik Arm. Belugas primarily use the waters near the outfall as a transit corridor and their exposure to elevated levels of contaminants in April and May, when the majority of runoff occurs, is likely limited (ADEC 2019).

5.7.6 Ballast Water Discharges

Globally, shipping has been found to be responsible for 69 percent of marine invasive species (Molnar et al. 2008). The impact of nonnatives in marine systems includes extirpation of native species through competition or predation, shifts in ecosystem food webs, and changes to the physical structure of the habitat (Norse and Crowder 2005). The National Invasive Species Act of 1996 mandates that all ships arriving in U.S. waters complete and submit a ballast water information report to the National Ballast Water Information Clearinghouse.

Discharges of wastes from vessels are regulated by the United States Coast Guard (USCG) and, by law, no discharges of any kind are allowed within three miles of land. The USCG established rules for controlling discharged ballast water in U.S. waters through publication of 33 CFR Part 151 and 46 CFR Part 162 in 2004. Ships must manage their ballast water by the following treatment methods and good practices:

- Perform ballast water treatment through installation and operation of an approved ballast water treatment system.
- Perform ballast water exchange 200 miles from shore.
- Avoid or minimize ballast water exchanges in risky or preserved areas.
- Clean ballast tanks regularly to remove sediments, rinse anchors and chains, and remove fouling from hull and piping.
- Maintain an approved ballast water management plan, as well as the written records of ballast water movements (uptake, transfer, discharge).
- Submit vessel and ballast water management information to USCG prior arrival in US harbors.

Before the problems with ballast water were fully recognized and regulated, untreated ballast water was released in Cook Inlet. The National Ballast Water Information Clearinghouse reported that more than five million metric tons of, likely untreated, ballast water were released in Cook Inlet between Homer and Anchorage from 1999 to 2003. Surveys conducted in

Kachemak Bay and Cook Inlet in 2000 found 13 invasive species in diverse taxonomic groups, including three hydroids, one bryozoan, two bivalves, and seven species of vascular plants (Hines and Ruiz 2000). When compared to similar surveys along the West Coast, there are relatively few invasives in Alaska's coastal waters (Ruiz et al. 2006). Dueñas et al. (2018) conducted a systematic literature review on invasive species' interactions with all ESA-listed species, and did not find any studies indicating that ESA-listed marine mammals were negatively impacted by invasive species.

The effects of discharged ballast water and the possible introduction of invasive species on fin whales, humpback whales, Cook Inlet beluga whales, and Steller sea lions, and their designated critical habitat are unknown and any ecosystem level impacts will take many years to be manifested.

5.7.7 Contaminants Found in Listed Species

Studies conducted in upper Cook Inlet found polychlorinated biphenyls (PCB), pesticides, and petroleum hydrocarbon levels below detectable limits in the water column and sediment, and heavy metals were below management levels (KABATA 2004; NMFS 2008a; USACE 2008).

Becker et al. (2000) compared levels of PCBs, chlorinated pesticides, heavy metals, and other elements between beluga populations in Greenland, the St. Lawrence Estuary, and Arctic Canada, and Cook Inlet, Point Hope, and Point Lay, Alaska. The Cook Inlet population had the lowest concentrations of PCBs, pesticides, cadmium, and mercury of all the populations, but had higher concentrations of copper than the other two Alaska populations. The lower levels might be related to differences in contaminant sources, food web differences, or different age distributions of the animals sampled. Concentration values of previously reported legacy organic contaminants in the Cook Inlet beluga whale population did not significantly change with the analysis of more recent samples; however, chemicals of emerging concern (e.g., polybrominated diphenyl ether, hexabromocyclododecane, and perfluorinated compounds) were identified. While the contaminant levels found in the Cook Inlet beluga whale population are lower than the levels in other populations, the effects of these contaminants on this population are unknown (Becker et al. 2000; NMFS 2008a).

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous in the environment, from both natural and anthropogenic sources, and are of special concern where they have the potential to be introduced at elevated concentrations from urban run-off, oil spills, municipal discharges, and oil and gas activities. High levels of PAHs have cytotoxic, genotoxic, immunotoxic, and carcinogenic effects on aquatic wildlife. In Cook Inlet, anthropogenic sources of hydrocarbons include oil and gas activities (e.g., produced water discharges), municipal wastewater discharge, stormwater runoff from roads and industrial areas, vessels, and spills (Saupe et al. 2014). The main, known natural sources in Cook Inlet include coal, oil seeps, peat, and hydrocarbon bearing source rock that enter Cook Inlet directly from rivers and coastal erosion, as well as from advection into the inlet (Saupe et al. 2014).

Beluga whales spend significant time in intertidal and nearshore areas, where the risk is often highest for exposure to PAHs (Saupe et al. 2014). Belugas may be exposed to PAHs through inhalation, direct contact with oil slicks or dissolved plumes, direct contact with contaminated sediments, or ingesting contaminated prey. Samples from belugas from the St. Lawrence Estuary, Cook Inlet, Arctic, and aquaria were analyzed, and significantly higher levels of intestinal PAH–DNA adducts were found in the St. Lawrence Estuary and Cook Inlet samples (Poirier et al. 2019). The presence of such an adduct indicates prior exposure to a potential carcinogen but does not by itself indicate the presence of cancer in the animal. Reynolds and Wetzel (2010) found elevated levels of PAHs in the livers of Cook Inlet beluga males, blubber of females, and in two fetuses. Thus far, necropsies on Cook Inlet belugas have not shown the high incidence of cancers that have been documented for the St. Lawrence Estuary population.

Concentrations of organochlorine and metal contaminants in baleen whales are low, and there is no firm evidence that levels of organochlorines, organotins, or heavy metals are high enough to cause toxic or other damaging effects (O'Shea and R. L. Brownell 1994). Baleen whales can accumulate lipophilic compounds (e.g., halogenated hydrocarbons) and pesticides (e.g., DDT) in their blubber as a result of feeding on contaminated prey or inhalation in areas of high contaminant concentrations (Barrie et al. 1992; Wania and Mackay 1993). Some contaminants may be passed on to young during gestation and lactation (Aguilar and Borell 1994). The health effects of different doses of contaminants on marine mammals are currently unknown; however, there is evidence of detrimental health effects from these compounds in other mammals, including disease susceptibility, neurotoxicity, and reproductive and immune system impairment (Reijnders 1986; de Swart et al. 1996; Eriksson, Jakobsson and Fredriksson 1998). Although there has been substantial research on the identification and quantification of such contaminants on individual whales, no detectable effect from contaminants has been identified in baleen whales. There may be chronic, sub-lethal impacts that are currently unknown.

Steller sea lions are exposed to local and system-wide contaminants and pollutants as they traverse the North Pacific basin. Effects on other pinnipeds have included acute mortality, reduced pregnancy rates, immuno-suppression, and reduced survival of first born pups (NMFS 2008b). There are no published reports of contaminants or pollutants, other than spilled oil, resulting in mortality of Steller sea lions (NMFS 2008b).

5.8 Fisheries

Cook Inlet supports several commercial fisheries, all of which require permits. Commercial fisheries are divided into the upper and lower Cook Inlet regions.[21] The upper region contains all waters north of Anchor Point and is further divided into the Northern (north of the West and East Foreland) and Central Districts (south of the Forelands to Anchor Point Light). Species commercially harvested in upper Cook Inlet include all five Pacific salmon species (drift and set gillnet), eulachon or smelt (dipnet), Pacific herring (gillnet), and razor clams (hand-digging). Sockeye salmon are the most economically valuable,[22] accounting for 92 percent of the total ex-vessel value over the past 20 years.[23]

The average annual commercial harvest of salmon in upper Cook Inlet from 1966-2016 was 3.5 million (Shields and Dupuis 2017). The most recent 20-year average annual commercial salmon

[21] http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareacookinlet.main Accessed April 2024.
[22] http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareauci.main Accessed April 2024.
[23] https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1546815985.pdf Accessed April 2024.

fishery harvest is 3.1 million fish, and the 2023 harvest of 1.9 million was 41 percent less than the 20-year average. The 2023 upper Cook Inlet commercial harvest compared to the recent 20-year average was down 2 percent for chum, 40 percent for sockeye, 53 percent for coho, 93 percent for Chinook, and 20 percent for pink salmon. Salmon are the primary prey item for Cook Inlet beluga whale and these numbers may be a cause for concern. At best, they indicate there are fewer salmon available for commercial fisheries, recreational, personal and subsistence use, and beluga whales.

The North Pacific Fishery Management Council first developed the Salmon Fishery Management Plan (FMP) under the Magnuson-Stevens Act more than 40 years ago. It excluded designated federal waters in Cook Inlet, which allowed the State of Alaska to manage commercial salmon fishing in the area. However, NMFS published a final rule implementing Amendment 16 to the Salmon FMP in April 2024, establishing Federal fishery management for all salmon fishing that occurs in the Cook Inlet EEZ, including commercial drift gillnet and recreational salmon fishery sectors (89 FR 34718, April 30, 2024). NMFS completed informal consultation in February 2024 concurring that the proposed Amendment 16 to the FMP was not likely to adversely affect the fin whale, Mexico DPS humpback whale, WNP DPS humpback whale, Western DPS Steller sea lion, or Cook Inlet beluga whale and its critical habitat.

Recreational fisheries exist in the river systems on the western Kenai Peninsula for salmon (Chinook, sockeye, pink, and coho), both freshwater and marine Dolly Varden char, and rainbow trout/steelhead trout. In the marine waters throughout Cook Inlet, recreational fishing occurs for salmon (Chinook and coho), Pacific cod, and halibut. Many of the charter fishing vessels targeting salmon and halibut operate out of Homer in lower Cook Inlet. A new recreational dipnet fishery on the Susitna River for all species other than Chinook salmon began in 2020.

Sport fishing for Chinook salmon in Cook Inlet salt waters was closed from May 15 through July 31, 2023,[24] and May 1 through August 15, 2024.[25] In conjunction with the 2023 closure, additional emergency orders prohibited the retention of wild Chinook salmon in the Ninilchik and Kasilof Rivers and restricted other Chinook salmon fisheries in the Susitna River, Northern Cook Inlet, and West Cook Inlet areas. Based on escapement monitoring in the Kenai, Anchor, and Deshka rivers, the Chinook salmon runs were forecast to be below the lower end of their escapement goals, which triggered the in-river sport fishery preseason closures in these streams. Additionally, all of these stocks failed to achieve their escapement goals in 2022 and 2023. The low productivity period was expected to continue for Cook Inlet Chinook salmon in 2024.

Potential impacts from fishing on fin whales, humpback whales, Cook Inlet beluga whales, and Steller sea lions include ship strikes, harassment, gear entanglement, reduction of prey, and displacement from important habitat. For example, the Kenai River is the most heavily-fished river in Alaska;[26] belugas no longer use waters near the river during salmon fishing season, despite the fact that it has the largest salmon run in Cook Inlet and was heavily used beluga

[24] https://www.adfg.alaska.gov/sf/EONR/index.cfm?ADFG=region.NR&Year=2023&NRID=3455 Accessed April 2024.
[25] https://www.adfg.alaska.gov/sf/EONR/index.cfm?ADFG=region.NR&Year=2024&NRID=3644#:~:text=(Homer)%20%2D%20In%20favor%20of,the%20latitude%20of%20Bluff%20Point Accessed April 2024.
[26] http://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSouthcentralUpperKenai.fishingInfo Accessed May 2023.

foraging habitat in the past (Ovitz 2019; Kumar, Castellote and Gill 2024).

5.8.1 Entanglement

Prior to the mid-1980s, there were only two reports of fatal takes of belugas incidental to entanglement in fishing gear in Cook Inlet (Murray and Fay 1979; Burns and Seaman 1986). There have been sporadic reports of single belugas entangled in fishing nets since then; however, the only confirmed mortality was a young Cook Inlet beluga carcass recovered from a subsistence set net in 2012. Non-lethal entanglements have been documented; in 2005, a beluga entangled in an unknown object, perhaps a tire rim or a culvert liner, was photographed in Eagle Bay (McGuire, Stephens and Bisson 2014), and another was repeatedly photographed (2010–2013) with what appeared to be a rope entangled around the upper portion of its body near the pectoral flippers (McGuire, Stephens and Bisson 2014). It is unknown if these animals were able to disentangle themselves or if they died as a result of the entanglements (NMFS 2016).

Humpback whales have been killed and injured during interactions with commercial fishing gear; however, the frequency of these interactions does not appear to have a significant adverse consequence for humpback whale populations. In Alaska, most humpbacks become entangled with gear between early June and early September while foraging in nearshore waters. A photographic study of humpback whales in Southeast Alaska found at least 53 percent of individuals showed some kind of scarring from fishing gear entanglement (Neilson et al. 2005).

Human-caused mortality and injury reported for humpback whales in Alaska from 2016 to 2020 was 65 animals, 47 of which were entanglements (Freed et al. 2022). In 2015, a humpback whale was entangled in a salmon purse seine net in Cook Inlet but was cut free by the fisherman, and was assumed to be unharmed (Delean et al. 2020). A minke whale or small humpback whale was reported entangled near the Lands End hotel in Homer in 2017, and a humpback whale was reported entangled near the Homer Spit in 2019 (NMFS unpublished data). These are the only known humpback whale entanglements in Cook Inlet.

Alaska Department of Fish and Game (ADFG) analyzed data from 1,439 individually marked Steller sea lions that were re-sighted from 2001 through 2015, and found that animals that had ingested salmon hook and line fishing gear had lower survival than comparable animals that had not ingested fishing gear (Freed et al. 2022). The minimum estimated mean annual mortality and serious injury rate in U.S. commercial fisheries between 2014 and 2018 was 37 Western DPS Steller sea lions, and this is likely an underestimate of the actual level (Muto et al. 2021). Between 2016 and 2020, human-caused mortality and injury of the Western DPS Steller sea lions (n = 148) was primarily caused by entanglement in fishing gear, in particular, commercial trawl gear (n=113; Freed et al. 2022). This mortality and serious injury estimate results from an actual count of verified human-caused deaths and serious injuries, and is a minimum because not all entangled animals strand nor are all stranded animals found, reported, or have the cause of death determined. Overall, the relative impact on the recovery of the Western DPS of Steller sea lion due to entanglement is ranked as low (NMFS 2008b).

5.8.2 Competition for Prey

Fisheries in Cook Inlet have varying likelihoods of competing with marine mammals for fish, depending on gear type, species fished, timing, and fisheries location and intensity. Cook Inlet beluga whales may experience reduced prey availability and/or habitat displacement due to commercial, subsistence, and recreational fishing activity. Watercraft operating near the mouths and deltas of rivers entering Cook Inlet, Turnagain Arm, and Knik Arm can deter beluga whales from pursuing eulachon and salmon prey in these waters. For example, belugas have not been observed in recent times in or near the Kenai River when salmon runs are strong and fishing activity is high; however, there are numerous reports of whales in the river before and after the summer salmon fishing season (Shelden et al. 2015b; Castellote et al. 2016b; Kumar, Castellote and Gill 2024).

Cook Inlet belugas are dependent on access to relatively dense concentrations of high value prey species, particularly in the spring and throughout the summer months. John et al. (2024) estimated that an average adult beluga would need to consume four to five Chinook salmon, 12 coho salmon, 13 to 14 chum or sockeye salmon, or 28 pink salmon per day to meet their daily energy expenditure. During the summer, 350 Cook Inlet beluga whales were estimated to consume a total biomass of approximately 1,250 metric tons of fish (Norman 2011). Chum, coho, and other salmonid species constitute greater than 54 percent of their summer diet (Hobbs and Shelden 2008). The 2023 upper Cook Inlet commercial salmon fishery harvest was 1.9 million fish, 41 percent less than the most recent 20-year average. A reduction in the amount of available prey could impact Cook Inlet beluga whale energetics and delay recovery.

There has been debate among the scientific community as to whether fisheries reduce Steller sea lion prey biomass and quality at local and/or regional spatial scales, which then leads to a reduction in Steller sea lion survival and reproduction (NMFS 2008b). The most recent minimum total annual direct mortality of Western DPS Steller sea lions associated with commercial fisheries is 37 individuals (Muto et al. 2021).

While fin and humpback whales may be present in lower Cook Inlet year round, their major foraging areas are located outside of Cook Inlet and prey competition is unlikely to occur.

5.9 Tourism

There are no commercial whale-watching companies operating in upper Cook Inlet. Aerial tours, such as guided hunting trips, may affect belugas by flying at low altitudes or circling the whales. NMFS has conducted outreach to local pilots and encouraged them to maintain an altitude of 457 m or higher over belugas and to avoid circling over the animals.

Tourism continues to grow in lower Cook Inlet, and a number of commercial vessel-based tour companies operate primarily out of Homer. The tour vessels range in size and capacity from six to over 100 passengers, and include fishing and wildlife viewing tours. There are also a number of commercial flight-seeing tour operators based in Homer. Flights occur over land on the Kenai Peninsula, the waters of lower Cook Inlet (Kachemak Bay), and across the Inlet to places such as Katmai National Park and McNeil River State Game refuge. Aircraft have the potential to disturb marine mammals, particularly pinnipeds hauled out.

5.10 Direct Mortality

Within the proposed action area there are several potential sources of direct anthropogenic mortality, including shootings, strandings, fishery/gear/debris interactions, vessel collisions, predation, and research activities. NMFS is not aware of any illegal shootings of listed marine mammals in Cook Inlet.

5.10.1 Subsistence Harvest

The ESA and MMPA allow for the harvest of marine mammal species by Alaska Natives for subsistence purposes and for creating and selling authentic native articles of handicrafts and clothing. Subsistence harvest of Western DPS Steller sea lions is regulated by co-management agreements with NMFS, and occurs at or well below sustainable levels of harvest. Annual statewide data on community subsistence harvest of Steller sea lions are no longer collected as of 2009; therefore, the best available statewide subsistence harvest estimates for Western DPS Steller sea lions are those from 2004 to 2008. The mean annual subsistence take (harvested plus struck-and-lost) from the Western DPS from 2004 through 2008, combined with the mean annual take between 2014-2018 from St. Paul, St. George, and Atka Island, was 209 sea lions per year (Muto et al. 2021).

With the exception of the harvest of bowhead whales by subsistence hunters in the Alaska Eskimo Whaling Commission's 11 member villages, subsistence hunters in Alaska are not authorized to take any species of great whales, which includes fin and humpback whales, under the Whaling Convention Act (16 USC § 916 et seq.). However, one humpback whale was unlawfully harvested in Kotlik in October 2006, and another in Toksook Bay in May 2016.

Previous Cook Inlet beluga subsistence harvests had a significant effect on the population. While an unknown amount of harvest occurred for decades or longer, the subsistence harvest increased substantially to unsustainable levels in the 1980s and 1990s. Harvests from 1994 to 1998 likely account for the population decline during that time period. Cook Inlet beluga whale subsistence harvest ceased in 1999 as a result of both a voluntary moratorium by the hunters and passage of Public Law 106–31, section 3022 (later made permanent by Public Law 106-553, section 627), which required any taking of Cook Inlet beluga whales by Alaska Natives to occur pursuant to a cooperative agreement between NMFS and affected Alaska Native organizations. The law did not specify a harvest level or a harvest management plan. In May 2000, NMFS designated Cook Inlet belugas as a depleted stock under the MMPA (65 FR 34590, May 31, 2000). Subsequently, NMFS promulgated interim harvest regulations that provided a harvest management plan (69 FR 17973, April 6, 2004). The co-management agreement developed pursuant to these regulations allowed the harvest of two whales in 2005 and one whale in 2006; however, no whales were taken in 2006 due to poor weather and the avoidance of females with calves. In 2008, NMFS issued regulations (73 FR 60976, October 15, 2008; 50 CFR § 216.23(f)) establishing long-term limits on the maximum number of Cook Inlet beluga whales that may be taken for subsistence by Alaska Natives. These long-term harvest limits, developed for five-year intervals, require that the abundance estimates reach a minimum five-year average of 350 belugas (50 CFR 216.23(f)(2)(v)). No hunt has been authorized since 2006.

5.10.2 Poaching and Illegal Harassment

The potential for poaching beluga whales in Cook Inlet exists due to their distribution within the most densely populated region in Alaska and their approachable nature. NMFS maintains an enforcement presence in upper Cook Inlet; however, effective enforcement across such a large area is difficult. NMFS Enforcement has investigated several reports of Cook Inlet beluga whale harassment, but there have been no confirmed poaching incidents.

Historically, Steller sea lions have been poached and illegally harvested throughout their range. The NMFS Alaska Marine Mammal Stranding Program documented 60 Steller sea lions with suspected or confirmed firearm injuries in Southeast and Southcentral Alaska from 2000–2019 (Wright 2016; Wright 2021). Western DPS Steller sea lions with gunshot wounds have been found stranded on shore along the outer Copper River Delta in recent years (Wright 2016; Wright 2021), and seven of nine pinnipeds stranded in the surveyed area in 2019 were shot (Wright 2021).

There are two known cases of unlawful harvests of humpback whales in Alaska. Subsistence hunters in western Alaska incorrectly believed they could legally harvest large whales other than bowheads (e.g., humpback, gray, and minke whales).

5.10.3 Stranding

Cook Inlet beluga whales are likely predisposed to stranding because they breed, feed, and molt in the shallow waters of upper Cook Inlet where extreme tidal fluctuations occur. Strandings may be intentional (e.g., to avoid killer whale predation), accidental (e.g., chasing prey into shallows then becoming trapped by receding tide), or a result of injury, illness, or death. Stranding events that last more than a few hours may result in mortalities. An estimated 876 to 953 live beluga strandings and 214 dead beluga beachings have been documented in Cook Inlet from 1988 through 2015 (NMFS 2016). Patterns of mortality for the population were analyzed and live stranding was the predominant assigned cause of death; however, this only represented approximately 33 percent of the deaths of known cause (McGuire et al. 2021). Causal factors for the majority of deaths and live strandings are unknown.

An unusually high number of beluga live stranding events occurred in Turnagain Arm in 2003 (Vos and Shelden 2005). The number of animals stranded ranged from two to 46 and led to five confirmed deaths (Vos and Shelden 2005). Stranding is a stressful event and, if the beluga survives, health after the event may be affected. Stranding events may represent a significant threat to the conservation and recovery of this population.

Live strandings are uncommon among sea lions; however, pinniped strandings and mortality resulting from entanglement in fishing gear have been documented (Loughlin and York 2000; Raum-Suryan, Jemison and Pitcher 2009; Muto et al. 2021).

Nearly all known cases of fin whale and humpback whale strandings involve animals that died at sea of various other causes and washed ashore. A fin whale live stranded and died in upper Knik Arm in June 2016. A young humpback live stranded on the mud in Turnagain Arm in April 2019 and, while it freed itself on an incoming tide at one point, the whale later died.

5.10.4 Predation

Killer whales are the only natural predators of beluga whales and Steller sea lions in Cook Inlet (Muto et al. 2021). Killer whale sightings were not well-documented prior to the mid-1980s and were likely rare in the upper Inlet. Alaska Native beluga hunters reported that killer whales were rarely seen in the upper Inlet or near belugas (Huntington 2000). Sightings from systematic surveys, observer databases, and anecdotal accounts from 1975 to 2002 were compiled, and there were only 18 documented sightings north of Kalgin Island (Shelden et al. 2003). Killer whales were not observed in upper Cook Inlet during approximately 4,000 hours of land- and vessel-based surveys conducted from 2005 to 2017, and there were no scars consistent with killer whale attacks in the photographs taken during these surveys (McGuire et al. 2020b). Monitoring efforts during the POA PCT construction project detected two transient killer whales in Knik Arm in September 2021. Two to three killer whales were observed in close proximity to belugas in Knik Arm near Cairn Point in September 2023.

Prior to 2000, it was estimated that an average of one Cook Inlet beluga whale was killed by killer whales annually (Shelden et al. 2003). From 1982-2014, between 9 and 12 beluga whale deaths were suspected to be a direct result of killer whale predation (NMFS 2016). NMFS received no reports of possible predation attempts in Cook Inlet from 2011 through 2020; however, killer whales have been visually and acoustically detected in the area during this time (61 North Environmental 2022a; Castellote et al. 2023).

The risk to Western DPS Steller sea lions from killer whale predation is considered potentially high (Muto et al. 2021), and may be one of the causes contributing to population declines in areas outside of Cook Inlet (Barrett-Lennard et al. 1995). An unsuccessful killer whale attack on a humpback whale was recorded in lower Cook Inlet in 2008 (Matkin 2011). The numbers of fin whales, humpback whales, and Steller sea lions are low in Cook Inlet and any isolated predation event that may occur would not have a population level effect.

5.10.5 Vessel Strikes

Cook Inlet beluga whales are susceptible to vessel strike mortality. In an examination of 106 individuals, 14 percent had signs of confirmed or possible vessel strike (McGuire et al. 2020b). Beluga whales may be more susceptible to strikes from commercial and recreational fishing vessels (as opposed to cargo ships, oil tankers, and barges) because both belugas and fishing activities occur where salmon and eulachon congregate. A number of beluga whales have been photographed with propeller scars (McGuire, Stephens and Bisson 2014), suggesting that small vessel strikes are not rare, but such strikes are often survivable. Small boats are able to quickly approach and disturb these whales in their preferred shallow coastal habitat.

From 1978-2011, there were at least 108 recorded whale-vessel collisions in Alaska, with the majority involving humpback whales and occurring in Southeast Alaska (Neilson et al. 2012). Between 2013 and 2021, 47 humpback whales were struck resulting in 22.12 mortalities or serious injuries in Alaska (Delean et al. 2020; Freed et al. 2022; Freed et al. 2023). Five fin whales were struck and killed between 2013 and 2021 (Delean et al. 2020; Freed et al. 2022; Freed et al. 2023).

There have been three documented large cetacean vessel collisions in Cook Inlet since 2001; one fin whale, one humpback whale, and one unidentified large cetacean. In 2001, a humpback whale was discovered on the bulbous bow of a 216 m container ship as it docked in the POA. In 2005, a 8.5 m charter boat hit an unidentified large cetacean, and a dead fin whale was discovered on the bulbous bow of a ship at the POA. The low number of fin and humpback whales in upper and middle Cook Inlet greatly reduces the probability of vessel strike in this area.

Although risk of vessel strike has not been identified as a significant concern for Steller sea lions, the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008b). In 2007, a Steller sea lion with two separate wounds consistent with blunt trauma that may have been from a vessel strike was found in Kachemak Bay. A vessel strike of a Steller sea lion is highly unlikely to occur due to their maneuverability, low numbers in upper and middle Cook Inlet, and the slow transit speeds of the project vessels.

5.10.6 Research

Research often assists in the recovery of threatened and endangered species; however, research activities may also disturb, harm, or kill the studied animal. Marine mammal research often requires the use of boats, which adds to vessel traffic, sound, and pollution in the area. Boat-based surveys, such as photo-identification studies, often require the boat to closely approach whales. Deployment and retrieval of passive acoustic monitoring devices requires a boat, which temporarily increases noise in the immediate area. Aerial surveys may also disturb whales, especially when circling at low-altitudes to obtain accurate group counts.

Scientific research and enhancement permits that authorize take of ESA listed marine mammals are issued as joint permits under section 104 of the MMPA and section 10(a)(1)(A) of the ESA. From 2017 through 2021, 11 MMPA/ESA research and enhancement permits authorized take of Cook Inlet beluga whales. In 2019, the Office of Protected Resources completed a programmatic biological opinion, which analyzed research impacts on endangered cetaceans; proposed research efforts on endangered or threatened cetacean populations were thought unlikely to cause a change in abundance or reproduction (NMFS 2019a).

More invasive research activities include animal capture, collecting blood and tissue samples, and attaching tracking devices such as satellite tags. Between 1999 and 2002, NMFS placed satellite tags on 18 beluga whales in upper Cook Inlet to collect data on dive behavior and movement within the inlet (Hobbs et al. 2005). In 2002, one of the belugas was found dead 32 hours after being tagged. Another two tagged beluga whales, with similar dive patterns and tagged in the same manner as the deceased whale, transmitted data for less than 48 hours; it is unknown if these whales also perished or were fitted with defective tags (NMFS, unpublished data). The Marine Mammal Laboratory, a division of NOAA Fisheries' Alaska Fisheries Science Center, began boat-based surveys in 2017 to collect skin and blubber biopsy samples from belugas. A large number of analyses are conducted with the samples, including vital rates (e.g., age and sex), contaminant burdens, diet composition, and health assessments (e.g., cortisol levels).

The Marine Mammal Laboratory also began a boat-based unmanned aircraft systems photogrammetry project in 2017. The project collects imagery, which will be used to estimate age class and an index of beluga calf production,[27] as well as to develop abundance estimates of the population.[28]

The Cook Inlet beluga whale photo identification project identified many of the tagged belugas; five of the 14 tagged whales in the photo-id catalog had visible signs of tag-site infection, eight had signs of concavity of the dorsal crest above the tag site, and two showed damage to the left pectoral fins, likely caused by flipper bands applied during tagging (McGuire and Stephens 2016). In 2015, a previously tagged whale washed up dead with a significant infection at the tag attachment site, potentially the cause of death. Another whale photographed with serious infection at the tag site has not been documented since 2007 (McGuire and Stephens 2016). It is unlikely that this type of project will be repeated and future research will focus on minimally invasive techniques.

It has been suggested that an increase in the authorized number of Cook Inlet beluga whale takes projected to occur through 2025 is statistically correlated with the decreasing population size (Migura and Bollini 2022). However, 99 percent of the total authorized take in any year are for non-invasive methods, such as photo-identification during vessel surveys. When permitted researchers approach animals closer than the NMFS wildlife viewing guideline distances,[29] it is counted as a "take" because those animals may be harassed by the activities. The potential impacts from these research methods are ephemeral harassment at worst. The programmatic biological opinion prepared for NMFS' cetacean research and enhancement permitting program (NMFS 2019a) mentioned above, determined that these methods (e.g., aerial and vessel surveys) are not likely to adversely affect any ESA-listed populations or species, including Cook Inlet beluga whales.

The number of authorized research takes is typically significantly larger than the number of actual takes that occur. For example, 22,090 takes were authorized for Cook Inlet beluga research occurring in 2019; 2,405 takes mostly by harassment occurred. Managers have simplified how take numbers in research permits are determined, in order to provide a more consistent approach to counting take across incidental and directed take permitting programs. NMFS Permits Division continues to closely analyze the number of takes requested and used by researchers each year.

In addition to research activities involving free-ranging Cook Inlet belugas, a single whale from the population is housed in captivity. "Tyonek" live-stranded near Trading Bay as a young calf in 2017. The Alaska Sealife Center and partners provided rehabilitative care; however, the animal was determined to be non-releasable due to underlying medical problems. Pursuant to a scientific research and enhancement permit, which includes an educational component, Tyonek is permanently located at SeaWorld San Antonio, Texas. This is a unique incident, and there are no plans to house additional Cook Inlet beluga whales in captivity.

With the low occurrence of fin whales, humpback whales, and Steller sea lions in upper and

[27] https://www.fisheries.noaa.gov/alaska/2018-cook-inlet-beluga-aerial-photogrammetry. Accessed July 2024.
[28] https://www.fisheries.noaa.gov/feature-story/noaa-fisheries-delay-new-aerial-survey-cook-inlet-beluga-whales-until-june-2025. Accessed July 2024.
[29] https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines/guidelines-&-distances Accessed April 2024.

middle Cook Inlet, this area is not a high priority for research of these species. However, they may be indirectly affected or harassed by other non-invasive research projects, such as the Cook Inlet beluga aerial surveys. Aircraft may disturb Steller sea lions, especially if hauled out. Disturbance of a rookery or haulout has the potential to result in serious injury or death, predominantly from trampling. However, there are no major rookeries or haulouts within Cook Inlet, and NMFS has no knowledge of any stampedes associated with research in the action area. Also, there have been no known instances of research-related deaths of fin or humpback whales in the action area.

5.11 Climate and Environmental Change

The impacts of climate change are especially pronounced at high latitudes and in polar regions. Average temperatures have increased across Alaska at more than twice the rate of the rest of the United States.[30] In the past 60 years, average air temperatures across Alaska have increased by approximately 3°F, and winter temperatures have increased by 6°F (Chapin et al. 2014). Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014). Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton 2001; McCarthy et al. 2001). The impacts of these changes and their interactions on listed species in Alaska are hard to predict.

Indirect threats associated with climate change include increased human activity as a result of regional warming. Less ice could mean increased vessel activity or construction activities with an associated increase in sound, pollution, and risk of ship strike. Human fishing pressure could change the abundance, seasonality, or composition of prey species. Fisheries in Alaska are managed with the goal of sustainability; however, not all fish stocks are assessed, and it is unknown whether management of fisheries for optimal returns provides sufficient densities in feeding areas for efficient foraging by ESA-listed marine mammal species.

Cook Inlet beluga whales likely rely on the combined salmon escapement from multiple watersheds. Changes in prey availability to belugas may result from changes in the total availability, quality, species composition, and seasonality of prey. The greatest climate change risks may be potential changes in salmon and eulachon abundance. These changes could occur through regime shifts and changes in ocean ecosystems and/or through changes in these species' freshwater habitat. Temperature and hydrology control several critical stages in the life cycle of salmonids in their freshwater habitats. During periods of rapid climate change, these can have significant effects on anadromous salmonid populations (Bryant 2009).

Temperature is the most important abiotic factor influencing the physiology of fishes and the pathogenicity of their disease organisms (Brett 1971; Marcogliese 2001). Fish are particularly vulnerable to mortality during periods of increased water temperatures, and mortality may occur through several mechanisms, including increased virulence of pathogens, increases in metabolic rate that outstrip energy resources, and an oxygen demand that exceeds the heart's capacity to deliver oxygen (von Biela et al. 2020). Stream temperatures are closely related to air

[30] https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska_.html Accessed April 2024.

temperatures (Mohseni and Stefan 1999), and the annual surface air temperatures north of 60° N in 2023 were the sixth warmest dating back to 1900.[31]

In June and July 2019, air temperatures over much of Alaska and the southern Yukon Territory reached record highs[32] and salmon dying before they could spawn were recorded in the Yukon River (von Biela et al. 2020), the Koyukuk River (Westley 2020), the Igushik River (a tributary to Bristol Bay where it was estimated that a minimum of 100,000 salmon died),[33] and the Kuskokwim River.[34] The parasites *Ichthyophonus* (a protozoan) and *Henneguya* (a cnidarian), which cause tapioca disease were prevalent in the salmon from the Kuskokwim. Pre-spawning mortality has also been documented in several Pacific Northwest watersheds, including the Fraser River in British Columbia (Hinch et al. 2012; Martins et al. 2012) and streams in the Lake Washington Basin in Washington (Barnett et al. 2020). The warming conditions during migration and spawning, in concert with other factors such as infections with pathogens, were responsible for the increased pre-spawning mortality of adult sockeye salmon, and were high enough to threaten the viability of the population (Barnett et al. 2020).

Mauger et al. (2017) monitored temperatures in 48 non-glacial streams across the Cook Inlet basin during open-water periods from 2008 to 2012 and found that numerous watersheds exceeded maximum weekly maximum temperature (MWMT) threshold ranges for the protection of salmon life stages. MWMT at most sites exceeded the established criterion for spawning and incubation during every year of the study, which suggests salmon are experiencing thermal stress in the Cook Inlet region (Mauger et al. 2017). The Deshka River, an important tributary to the Susitna River, had MWMT temperatures above 64°F during four years of the study period and above 68°F for three years (Mauger et al. 2017). As stream temperatures increase in response to increasing air temperatures, critical thresholds will likely be exceeded more often, especially when warm air temperature anomalies occur.

Population modeling linked Cook Inlet beluga reproductive success with salmon abundance in the Deshka River (Norman et al. 2020). Simulations showed that if salmon runs remained at their current levels, the Cook Inlet beluga whale population would likely continue its current slow decline and per capita births would continue to be low. However, Cook Inlet beluga whales forage at several streams throughout the summer and likely rely on the combined escapement from multiple watersheds. The concept of food resources limiting a cetacean population is not new, and reduced prey availability (Chinook salmon) has been directly linked to increased mortality and reduced health and survival of the Southern Resident killer whale population (Ward, Holmes and Balcomb 2009; Wasser et al. 2017).

In summary, the effects of climate change will likely impact Cook Inlet beluga whales, primarily through their primary prey species, salmon. Warmer ocean temperatures, warmer stream temperatures, and warmer air temperatures will likely lead to many challenges and changes to the freshwater and marine ecosystems that salmon depend on. Pre-spawning salmon mortalities,

[31] https://arctic.noaa.gov/report-card/report-card-2023/surface-air-temperature-2023/ Accessed April 2024.
[32] https://www.ncei.noaa.gov/news/national-climate-201912 Accessed April 2024.
[33] https://alaskapublic.org/2020/01/15/in-some-bristol-bay-rivers-the-hottest-month-on-record-was-deadly-for-salmon/ Accessed April 2024.
[34] https://www.kyuk.org/hunting-fishing/2019-07-12/record-warm-water-likely-gave-kuskokwim-salmon-heart-attacks Accessed April 2024.

reductions in returns, and shifts in run timing have already been documented.

Cook Inlet beluga whale critical habitat may be affected by climate change and other large-scale environmental phenomena, including the Pacific Decadal Oscillation (PDO; a long-lived El Niño-like climate variability that may persist for decades) and ecological regime shifts. Climate change can potentially affect prey availability, glacial output and siltation, and salinity and acidity in downstream estuarine environments (NMFS 2010a; NMFS 2016). PDO may influence rainfall, freshwater runoff, water temperature, and water column stability. Ecological regime shifts, in which species composition is restructured, have been identified in the North Pacific (Hollowed and Wooster 1992; Anderson and Piatt 1999; Hare and Mantua 2000) and are believed to have affected prey species availability in Cook Inlet and the North Pacific. These events may result in seasonal and spatial changes in prey abundance and distribution, and could affect the conservation value of designated critical habitat for Cook Inlet beluga whales.

An unusual mortality event of large cetaceans occurred in Alaska waters in 2015-2016. Reports of dead whales included 22 humpback, 12 fin, two gray, one sperm, and six unidentified whales. There was an unusually large number of dead whales found in British Columbia during this time as well. The strandings were concurrent with the arrival of the Pacific marine heatwave, one of the strongest El Nino weather patterns on record, decreasing ice extent in the Bering Sea, and one of the warmest years on record in Alaska in terms of air temperature.

Recent studies and observations have shown changes in distribution (Brower, Clarke and Ferguson 2018), body condition (Neilson and Gabriele 2020), and migratory patterns of humpback whales, likely in response to climate change. The indirect effects of climate change on humpback whales over time would likely include changes in the distribution of ocean temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

The Pacific marine heatwave is also likely responsible for poor growth and survival of Pacific cod, an important prey species for Steller sea lions. The 2018 Pacific cod stock assessment estimated that the female spawning biomass of Pacific cod was at its lowest point in the 41-year time series considered. This assessment was conducted following three years of poor recruitment and increased natural mortality during the Gulf of Alaska marine heat wave from 2014 to 2016 (NMFS 2018a). The spawning stock biomass dropped below 20 percent of the unfished spawning biomass in 2020 and the federal Pacific cod fishery in the Gulf of Alaska was closed by regulation to directed Pacific cod fishing in 2020 as a result (Barbeaux, Holsman and Zador 2020). As of late 2023, Pacific cod abundance remained at reduced levels; however, the population is showing signs of growth.[35]

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the Western DPS (NMFS 2008b). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount.

[35] https://apps-afsc.fisheries.noaa.gov/REFM/docs/2023/GOABrief.pdf accessed January 2024.

Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008b). Populations of Steller sea lions in the Gulf of Alaska and Bering Sea have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter et al. 2009).

5.11.1 Biotoxins

As temperatures in Alaska waters warm and sea ice diminishes, marine mammal health may be compromised through nutritional and physiological stress, toxins from harmful algal blooms, and exposure to new pathogens. An unprecedented harmful algal bloom extended from the Aleutian Islands to southern California as a result of the Pacific marine heatwave, and was linked to mass strandings of marine mammals (Cavole et al. 2016). The neurotoxins domoic acid and saxitoxin are two of the most common biotoxins found along the west coast of North America (Lefebvre et al. 2016). These toxins can have sublethal effects, including reproductive failure and chronic neurological disease, and can also cause death (Broadwater, Van Dolah and Fire 2018).

Domoic acid and saxitoxin have been documented in zooplankton, clams, worms, planktivorous fish, marine mammals, and seabirds in Alaska. Lefebvre et al. (2016) detected domoic acid in all 13 Alaskan marine mammal species examined, saxitoxin in 10 of the 13 species, and both toxins were present in five percent of the animals tested. It is unknown if exposure to multiple toxins suppresses immunity or results in additive or synergistic effects (Broadwater, Van Dolah and Fire 2018). With declining sea ice, warmer water temperatures, and changes in ocean circulation patterns, more frequent and intense harmful algal blooms are likely.

5.11.2 Disease

In addition to influencing animal nutrition and physiological stress, environmental shifts caused by climate change may foster exposure to new pathogens in Alaskan marine mammals. Through altered animal behavior and the absence of physical barriers, loss of sea ice may create new pathways for animal movement and introduction of infectious diseases.

New open water routes through the Arctic suggest that opportunities for pathogens, such as phocine distemper virus, to cross between North Atlantic and North Pacific marine mammal populations may become more common (VanWormer et al. 2019). Phocine distemper virus is a pathogen responsible for extensive mortality in European harbor seals in the North Atlantic. The virus was first detected in the North Pacific Ocean in 2004 in sampled northern sea otters (VanWormer et al. 2019). Brucella and Phocid herpesvirus-1 have also been found in Alaskan marine mammals (Zarnke et al. 2006); herpesviruses have been implicated in fatal and nonfatal infections of harbor seals in the North Pacific (Zarnke et al. 2006).

An unusual mortality event involving primarily ice seals in northern and western Alaska occurred from May 1, 2011 to December 31, 2016. The investigation identified that clinical signs (skin lesions) were likely due to an abnormality of the molt, but a definitive cause for the abnormal molt and the UME was not determined. The minimum estimate of the total number of impacted seals was 657.[36] Another UME was declared for ice seals in the Bering and Chukchi seas due to elevated strandings starting in June 2018. All age classes were affected and many of the seals had low fat thickness. The cause of this UME has not been determined, but extreme sea ice conditions (low sea ice maximums and rapid sea ice retreat) could have impacted the health of the seals. A subset of the stranded seals were sampled for genetics and harmful algal bloom exposure.[37]

6 EFFECTS OF THE ACTION

"Effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.02).

This biological opinion relies on the best scientific and commercial information available. We try to note areas of uncertainty, or situations where data is not available. In analyzing the effects of the action, NMFS aims to minimize the likelihood of false negative conclusions (i.e., concluding that adverse effects are not likely when such effects are, in fact, likely to occur).

We organize our effects analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

We conclude this section with an *Integration and Synthesis of Effects* that integrates information presented in the *Status of the Species* and *Environmental Baseline* sections of this opinion with the results of our exposure and response analyses to estimate the probable risks the proposed action poses to endangered and threatened species.

NMFS identified and addressed all potential stressors, and considered all consequences of the proposed action, individually and cumulatively, in developing the analysis and conclusions in this opinion regarding the effects of the proposed action on ESA-listed species and designated critical habitat.

6.1 Project Stressors

Stressors are any physical, chemical or biological phenomena that can induce an adverse response. The effects section starts with identification of the stressors produced by the

[36] https://www.fisheries.noaa.gov/alaska/marine-life-distress/diseased-ice-seals-and-unusual-mortality-events#:~:text=Since%20June%201%2C%202018%2C%20elevated,Unusual%20Mortality%20Event%20(UME). Accessed July 2024.
[37] https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2022-ice-seal-unusual-mortality-event-alaska Accessed July 2024.

constituent parts of the proposed action.

Based on our review of the IHA application, personal communications, and available literature as referenced in this biological opinion, the proposed activities may cause the following stressors to ESA-listed marine mammals:

- Acoustic disturbance from non-tugging activities (e.g., production drilling operations, vessel support operations, and aircraft support operations)
- Vessel strike
- Seafloor disturbance
- Effects on prey
- Trash and debris
- Pollutants and contaminants
- Acoustic disturbance from tugs towing, holding, and positioning the jack-up rig

6.1.1 Minor Stressors on ESA-Listed Species

Based on a review of available information, we determined the following stressors are either unlikely to occur or likely to have minimal impacts on fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions.

6.1.1.1 Acoustic Disturbance from Non-tugging Activities

6.1.1.1.1 Production Drilling Operations

Equipment like generators and mud pumps produce sound during production drilling. Rig generators are located above the drill deck, approximately 24 m to 43 m above mean high water, and the mud pumps are located on the jack-up rig. The transfer of sound from this equipment into the water column is limited by their location.

Below the drill deck and above the supportive superstructure, there are multiple floors/levels of various permanently installed production and operations equipment that run constantly, including compressors, generators, turbines, and fluids handling and pumping systems. This production equipment on the permanent drilling rigs is greater in size and capacity, and is located closer to the water than the equipment on smaller mobile rigs.

Drilling in existing wells occurs hundreds to several thousand feet below the seafloor and within existing well slots or existing wellbores; the sound from drilling in existing wells is expected to be quieter than drilling in new wells. There are currently no known underwater acoustic measurements for on-platform production drilling from existing wells; however, Hilcorp is collecting underwater acoustic measurements of sounds associated with an active platform, which includes drilling. Analysis of the acoustic data will not be available until later in 2024.

Furie Operating Alaska collected underwater acoustic measurements in the vicinity of the Spartan 151 while drilling in new wells northeast of Nikiski Bay in water depths of 24.4 to 27.4

m (Marine Acoustics Inc. 2011). The primary sources of rig-based acoustic energy were from the D399/D398 diesel engines, PZ-10 mud pump, ventilation fans, and electrical generators. The in-water source level of the diesel generators was estimated to be 137 dB re 1 μPa rms at 1 m in the 141 to 178 Hz frequency range. JASCO measured sound source levels from the Yost jack-up rig in the Kitchen Lights Unit during the drilling of a new well in 2016. The primary in-water sources of continuous sounds were drilling (158 dB) and mud pumping (148.4 dB), which produce 120 dB isopleths of 330 and 225 meters, respectively. The acoustic energy of drilling sound was found to be predominantly under 500 Hz (Denes and Austin 2016).

Drilling sounds are relatively low-level and low-frequency, and the addition of the mobile jack-up rig is not expected to create a discernible increase in the overall sound generated by platform operations. The platforms associated with the proposed action are located in deeper water with open water in all directions. Marine mammal density is low in these areas and we are unaware of any specific important habitat features (e.g., concentrations of prey or refuge from predators) that would attract animals into the area and result in higher levels of sound exposure.

All production drilling will occur within Cook Inlet beluga whale habitat. However, we do not expect low-level drilling noise to impact important biological functions or measurably alter habitat use of belugas. The number of belugas near the drilling platforms is expected to be low; their core range continues to contract north and during the summer and fall, the whales prefer the shallow coastal waters in the upper inlet in and near the Susitna River Delta, Knik Arm, Turnagain Arm, Chickaloon Bay, and near Fire Island (Shelden et al. 2015b; Castellote et al. 2016a; McGuire et al. 2020a), as well as near the Kenai River in the lower inlet (McGuire et al. 2020a). Beluga sightings in the action area have been infrequent and sightings of other listed marine mammal species near the platforms are also uncommon, and their densities in the area are low.

Drilling sound is naturally "ramped up" from an initial low rotation pressure, and marine mammals in the area are likely to be fully aware of the rig presence long before approaching. Additionally, Hilcorp will monitor prior to the startup of the jack-up rig generators and mud pumps, and delay activities if a listed marine mammal is observed within 330 m.

Drilling operations are not expected to cause a disruption in marine mammal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering, resting or migrating. Therefore, the impact of production drilling sound is expected to be very minor, and any effects to fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions is expected to be immeasurably small.

6.1.1.1.2 Vessel Support Operations

Vessels of various types and sizes are used to support project activities, specifically for transport of crew and supplies to the rigs and platforms. The primary underwater sound associated with vessel operations is the continuous cavitation sound produced by the propeller arrangement. Bow thrusters are occasionally used for a short duration (20 to 30 seconds) when performing docking maneuvers in unfavorable sea states. Other vessel sound sources include onboard diesel generators and the main engine; however, both are subordinate to the thruster and main propeller blade rate harmonics (Gray and Greeley 1980).

There is a low density of listed species in the project area; however, auditory or visual disturbance to these species could occur during project-related vessel activities. A listed species could react by either investigating or being startled by vessels. Disturbance from vessels could temporarily increase stress levels or displace an animal from its habitat. Underwater noise from vessels may temporarily disturb or mask communication of marine mammals. Behavioral reactions to vessels can vary depending on the type and speed of the vessel, the spatial relationship between the vessel and the animal, the species, and the behavior of the animal prior to the disturbance from the vessel. Response also varies between individuals of the same species exposed to the same sound.

If animals are exposed to vessel noise and presence, they may exhibit deflection from the noise source, engage in low level avoidance behavior, exhibit short-term vigilance behavior, or experience and respond to short-term acoustic masking behavior, but these behaviors are not likely to result in significant disruption of normal behavioral patterns. Vessels moving at slow speeds and avoiding rapid changes in direction or engine RPMs may be tolerated by some species. Other individuals may deflect around vessels and continue on their migratory path.

Behavioral responses of beluga whales to vessels include changing swimming direction, increasing swim speed, altering diving, surfacing, and breathing patterns, and changes in vocalizations (Wartzok et al. 2003). Past experiences with vessels, age, and activity during the vessel encounter appear to be important factors when considering the response of an animal (Wartzok et al. 2003; McQuinn et al. 2011). Older animals respond more often than younger animals, and belugas respond less often when engaged in feeding or traveling than during other activities. However, when whales did respond, the response was typically more pronounced (Fish and Vania 1971; Stewart, Evans and Awbrey 1982; Blane and Jaakson 1994).

Cetaceans, including belugas, have been documented altering their calling rates and duration in noisy environments (Finley et al. 1990; Wright et al. 2007; Dunlop, Cato and Noad 2014; Erbe, Dunlop and Dolman 2018). Belugas also change their vocalization frequency and intensity in response to noise in their environment (Au et al. 1985). Changes in calling rates, repetition of calls, increase in call duration, and upward shift in frequency of beluga vocalizations were observed in response to vessel noise in the St. Lawrence River (Lesage et al. 1999; Scheifele et al. 2005). Vocal responses were more persistent when the whales were exposed to noise from a ferry compared to a small motorboat (Lesage et al. 1999). Beluga vocalizations and echolocation may also be masked by vessel sound. In Cook Inlet, the communication band of belugas was found to be fully masked by ambient noise and anthropogenic noise from a containership positioned at 5,000 m. The echolocation band was partially masked at shorter ranges (up to 2,500 m; Eickmeier and Vallarta 2023).

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, suggesting an energetic cost to the affected animal. Humpback cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached (Morete, Bisi and Rosso 2007). Responding to vessels is likely stressful to humpback whales, but the biological significance of that stress is unknown (Bauer and Herman 1986). Fin whales were observed to respond to vessels at a distance of about one kilometer (Edds and Macfarlane 1987). Fin whales stopped feeding, swam away, spent less time at the surface, and increased respiration rates when closely approached by vessels (Jahoda et al. 2003).

Potential impacts of vessel disturbance on Steller sea lions have not been well studied, and the responses will likely depend on the season and stage in the reproductive cycle (NMFS 2008b). Steller sea lions are more likely to be disturbed at haulouts and near rookeries, where in-air vessel noise or visual presence could cause behavioral responses such as avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups (Calkins and Pitcher 1982; Kucey 2005). Hilcorp's planned activities will not occur near any major pinniped haulouts or rookeries. The effects of vessel presence on Steller sea lions in open water is likely to be temporary as the vessel approaches and passes. Increases in ambient noise from vessel traffic, however temporary, has the potential to mask communication between sea lions, and affect their ability to detect predators (Richardson and Malme 1993; Weilgart 2007).

Project vessel activity will increase sound in Cook Inlet during the proposed action. Marine mammal responses to vessel noise may include changes in behavioral states (Richardson et al. 1995), changes in vocalizations (Lesage et al. 1999; Scheifele et al. 2005; Gervaise et al. 2012), and temporary displacement (Blane and Jaakson 1994; Erbe and Farmer 2000). However, any changes are not expected to cause a significant disruption of those behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering, resting or migrating.

Hilcorp will implement mitigation measures during vessel support operations, including not positioning vessels in the path of a whale or cutting in front of a whale in a way or at a distance that causes a whale to change behavior, staying 91 m away from listed marine mammals, avoiding changing direction and speed as well as reducing speed within 274 m of whales, and reducing speed when visibility is reduced. These measures minimize effects on listed marine mammals and reduce the likelihood animals will be exposed to vessel sound that could cause a significant disruption in behavioral patterns. Any overlap of marine mammal presence with project vessels transiting to/from Nikiski is expected to be short in duration, and behavioral reactions are expected to be brief and minor.

Vessel support operations are not expected to cause a disruption in marine mammal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering, resting or migrating. Impacts to fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions from vessel sound are expected to be undetectable and minor due to the low density of these species in the area, short duration of spatial overlap, low likelihood of exposure to sound that could significantly disrupt behavioral patterns, and implementation of mitigation measures.

6.1.1.1.3 Aircraft Support Operations

Helicopters will transit from the mainland to the production sites to deliver supplies and transport personnel. Flights will follow a direct route at an altitude of 457 m or higher, as practicable, to avoid acoustical harassment of marine mammals.

Transmission of aircraft sound into the water is greatest directly below the aircraft; much of the sound is reflected and does not penetrate at angles greater than 13 degrees from vertical. Received sound levels in water from aircraft flying at an altitude of 152 m were 109 dB re 1 µPa for a Bell 212 helicopter, 101 dB re 1 µPa for a small fixed-wing aircraft, 107 dB re 1 µPa for a twin otter, and 124 dB re 1 µPa for a P-3 Orion (four-engined, turboprop anti-submarine and maritime surveillance aircraft; Richardson et al. 1995). The dominant tones for helicopters and fixed-wing aircraft are generally less than 500 Hz (Richardson et al. 1995). The duration of underwater sound from passing aircraft is also much shorter in water than air. A helicopter flying at an altitude of 152 m is audible underwater at 3 m depth for 38 seconds and for 11 seconds at 18 m depth.

Marine mammals could be disturbed by the sound or physical presence of low-flying aircraft. Airborne noise and visual cues are more likely to disturb individuals resting at the sea surface or hauled out on ice or land (BOEM 2012). Marine mammals underwater could also be disturbed by sound propagating beneath the surface or by the shadow of the aircraft overhead. Aerial survey observations indicate highly variable behavioral responses from marine mammals, ranging from no observable reaction to diving or rapid changes in swimming speed/direction (Efroymson and Suter 2001; Smultea et al. 2008). It is often difficult to determine if the behavioral reactions are due to the aircraft sound, physical presence and visual cues associated with the aircraft, or a combination of both (Richardson et al. 1995).

During the Cook Inlet beluga whale aerial surveys, conducted in a fixed-wing aircraft at 244 m, belugas are often observed swimming in the same direction and speed without any noticeable change in activity while the aircraft circles (Rugh, Shelden and Mahoney 2000). Individual responses may vary depending on beluga activity, sound characteristics, and previous exposure to the sound. There is limited research on baleen whale responses to aircraft sound. Reactions are likely influenced by group size and behavioral activity (Richardson et al. 1995; Patenaude et al. 2002; Weilgart 2007), with whales in larger feeding or social groups reacting less than whales in confined waters or with calves. How Steller sea lions respond to aircraft sound is likely dependent upon age, sex, and season. Dominant, territory-holding males and females with young were found to be less likely to leave a haulout site in response to an aircraft overflight as compared to juveniles and pregnant females (Calkins 1979). Pups on land are especially vulnerable to trampling if adults are panicked by low flying aircraft. There are no known haulouts or rookeries in the action area.

During take-off and landing, only a small amount of sound is expected to penetrate the water for a short period of time as the helicopter will be moving nearly vertically over the helipad and sound does not penetrate water at angles greater than 13 degrees from vertical. Helicopters descend onto the helipad (approximately 24 to 30 m above mean high water) at approximately 91 m per minute and ascend at approximately 152 m per minute. Any helicopter sound that does penetrate the water is expected to be low enough that it does not disrupt the behavioral patterns of marine mammals (Marrett 1992).

Aircraft support operations are not expected to cause a disruption in marine mammal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering, resting or migrating. Any reactions are expected to be imperceptible or very mild and brief. Impacts to fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS

Steller sea lions from aircraft sound are expected to be minimal or undetectable due to the low density of these species in the area, short duration of spatial overlap, low likelihood of exposure to sound that could significantly disrupt behavioral patterns, and implementation of mitigation measures.

6.1.1.2 Vessel Strike

Ship strikes can cause major wounds or death to marine mammals. An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or a vessel propeller could injure or kill an animal below the water surface. From 1978 to 2011, there were 108 recorded whale-vessel collisions in Alaska, with the majority occurring in Southeast Alaska between May and September (Neilson et al. 2012). Small recreational vessels traveling at speeds over 13 knots were most commonly involved in ship strike encounters; however, all types and sizes of vessels were reported (Neilson et al. 2012). The majority of vessel strikes involved humpback whales (86 percent) and the number of humpback strikes increased annually by 5.8 percent from 1978 to 2011. Forty-four humpback whales were reported struck by vessels in Alaskan waters between 2013 and 2021 (Delean et al. 2020; Freed et al. 2022; Freed et al. 2023). There have been two reported ship strikes of unidentified large cetaceans in Kachemak Bay, lower Cook Inlet between 2000 and 2021.

Fin whale mortality due to ship strike was reported in 2014, 2016, 2018, and 2020 in Alaskan waters (Delean et al. 2020; Freed et al. 2022; Freed et al. 2023). A dead fin whale was discovered on the bulbous bow of a freighter at the Port of Alaska in 2015 (Savage 2017). The vessel traveled from Seattle and it was unknown where the strike occurred.

Ship strikes of smaller cetaceans are less common than large whales, possibly due to their size and more agile nature. Cook Inlet beluga whales have been photographed with propeller scars (McGuire, Stephens and Bisson 2014). Individual belugas photographed between 2005 and 2017, along with stranding records, were examined to determine prevalence of scars indicative of anthropogenic trauma (McGuire et al. 2020b). Out of 78 whales examined, 14 percent had signs of confirmed or possible vessel strikes. Vessel strikes of belugas have also been documented in the St. Lawrence River Estuary (Lair, Measures and Martineau 2015). Smaller boats traveling at higher speeds with frequent changes in direction frequently present a greater threat than larger, slower vessels moving in straight lines.

There are only four records of stranded Steller sea lions with injuries indicative of vessel strike in Alaska, three occurred in Sitka and one in Kachemak Bay. Steller sea lions are likely more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008b). The risk of vessel strike, however, has not been identified as a significant concern for Steller sea lions. Steller sea lions are not concentrated in any locations near the action area.

There may be an increased risk of vessel strike due to the increased traffic associated with the proposed action. The jack-up rig is expected to be moved three times over the course of six days during a one-year period. The tugs will be actively under load with the jack-up rig for only a portion of each 24-hour period, and the average travel speed while towing is four knots. During jack-up rig mobilization and demobilization, one support vessel will be used continuously for approximately 30 days to facilitate moving rig equipment and materials. When the rig is being set up at the location, there will be approximately five vessel trips to deliver equipment, mud products, drill pipe, and other tangibles needed for drilling. Vessel trips to and from the platform while drilling is occurring are expected to increase (on average) by two trips per day from normal platform operations. These vessels typically travel at 7 knots and cannot exceed 9 knots, due to cooling system constraints.

Vessel speed is a principal factor in whether a strike results in serious injury or death of a whale. Laist et al. (2001) determined that most lethal or severe injuries involved ships traveling 14 kts or faster. Serious injuries were found to occur infrequently at vessel speeds below 14 kts, and rarely at speeds below 10 kts. Vanderlaan and Taggart (2007) found the greatest rate of change in the probability of a lethal injury to a large whale occurs between vessel speeds of 8.6 and 15 kts, and the probability of a lethal injury drops below 50 percent at 11.8 kts.

The slow operational speeds of project vessels and the implementation of mitigation measures, including staying 91 m away from listed marine mammals, avoiding changing direction and speed as well as reducing speed within 274 m of whales, and reducing speed when visibility is reduced, limit the risk of strike from the proposed action. The low number of fin whales, humpback whales, beluga whales, and Steller sea lions in the action area also greatly reduces the probability of a vessel strike occurring. The likelihood of vessel strike is considered to be improbable.

6.1.1.3 Seafloor Disturbance

The presence of the jack-up rig could result in a temporary loss of marine mammal habitat. There is potential for disturbance from the anchoring system for the jack-up rig, displacement of sediments, and discharge of drilling waste (BOEM 2017). The area of disturbance is likely to vary based on currents and other environmental factors.

The total area of seafloor disturbed during the placement and removal of the jack-up rig stabilizers (i.e., the drilling rig legs) will depend on the rig design and diameters of the legs. Hilcorp plans to use the Spartan 151 drill rig, which is estimated to disturb 2.5 acres of seafloor during the setup (BOEM 2017).

Discharge of drill cuttings or other liquid waste produces temporary and localized turbidity in the water column and alteration of the benthic environment around individual well sites. The settling of drilling fluid and cuttings discharge smothers benthic areas/species and disturbs pelagic species (Tetra Tech Inc. 2012). Burial and smothering are most likely to occur within a radius of approximately 500 m around each well site, affecting an area of 0.78 km^2 per well site.

Seafloor disturbance, turbidity, and discharge from activities may affect the prey species distribution and diversity, as well as the ability of marine mammals to locate prey in the immediate area of the drilling activities. However, the resuspension of sediments would likely be highly localized and temporary, and any sediment plumes generated would be a minor contribution to the existing level of suspended sediments due to the currents and tidal actions in Cook Inlet (Brabets et al. 1999). The discharge of drilling fluids and cuttings is unlikely to have large-scale effects on marine mammals, either through direct contact or indirect effects on their prey; the effects would be restricted to the areas immediately surrounding the drill-site.

There are also no appreciable adverse impacts expected for benthic populations, due in part to their large reproductive capacities and the naturally high levels of predation and mortality of these populations. In addition, disturbed areas are likely to begin the process of recolonization following the benthic disturbance (Conlan and Kvitek 2005; BOEM 2015a). Amphipods, copepods, shrimp, nematodes, and polychaetes are among the first to recolonize, usually in less than a year (Trannum et al. 2011).

Increases in turbidity will be temporary, localized, and difficult to detect in waters that have a very high concentration of suspended solids because of glacial runoff and extreme tidal exchange. Impacts on zooplankton, fish, and marine mammals are expected to be brief, intermittent, and minor, if impacts occur at all. Any effects to ESA-listed species from seafloor disturbance and increased turbidity levels would be immeasurably small.

6.1.1.4 Effects on Prey

Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy.

Project activities will produce non-impulsive, continuous sounds (i.e., production drilling, tugs towing the jack-up rig). Injury to fish depends more on the magnitude of particle motion than on sound levels as mammals perceive it (Popper and Hawkins 2019). It is likely that fish will avoid sound sources within ranges that may be harmful (McCauley, Fewtrell and Popper 2003). The most likely impact to fish from project activities in the action area would be temporary behavioral avoidance. The duration of fish avoidance of the area is unknown, but a rapid return to normal recruitment, distribution, and behavior is expected.

In general, impacts to marine mammal prey species are expected to be minor and temporary, given the small area of activity relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. We expect the area in which stress, injury, or changes in balance of prey species may occur will be limited to a few meters directly around ongoing operations. We consider potential adverse impacts to prey resources from project activities in the action area to be immeasurably small.

Studies on euphausiids and copepods, two of the more abundant and biologically important groups of zooplankton, have documented some sensitivity of zooplankton to sound (Chu, Sze and Wong 1996; Wiese 1996); however, any effects of project activities on zooplankton would be expected to be restricted to the area within a few meters of the activity and would likely be sub-lethal. Any mortality or impacts on zooplankton as a result of operations is immaterial as compared to the naturally occurring reproductive and mortality rates of these species.

Given the relatively small areas being affected, the localized response of prey species, and the rapid return of any temporarily displaced species, project activities are unlikely to have a permanent effect on any prey habitat or prey species. Any impacts to marine mammal prey species are not expected to result in measurable consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Based on the above information, prey species may respond to noise associated with the proposed action by avoiding the immediate area. However, the expected impact of project activities on marine mammal prey is very minor, and thus adverse effects to fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions will be immeasurably small.

6.1.1.5 Trash and Debris

The three tugs are each attached to the jack-up rig by approximately 30 m of AmSteel-Blue rope. The lines are in the air and taut while the jack-up rig is under tow. The risk of entanglement is immeasurably small due to the limited number of lines in use, their location above the water surface during towing, and that the lines will be taut.

The project will generate trash comprised of paper, plastic, wood, glass, and metal, mostly from galley and food service operations. A substantial amount of waste products could also be generated from production activities. Project trash and debris could be released into the marine environment, posing a risk to marine mammals. Hilcorp will comply with all applicable regulations, and the amount of project-generated trash and debris is expected to be minimal. The impact of trash and debris is expected to be very minor, and adverse effects to ESA-listed species will be immeasurably small.

6.1.1.6 Pollutants and Contaminants

Authorized discharges from project activities and ongoing production associated with Hilcorp's oil and gas operations would include drilling fluids and cuttings, deck drainage, sanitary and domestic waste, desalination unit brine, cooling water, bilge and ballast water, and other miscellaneous discharges. Most of these discharges would be rapidly diluted in receiving waters such that there would be very limited potential for effects on any listed marine mammals. Discharges are regulated through the NPDES permit, and impacts to listed species from exposure to pollutants, suspended solids, or bacteria-or virus-containing effluents discharged in compliance with permit requirements are likely undetectable (BOEM 2017).

Increased vessel activity in the action area will temporarily increase the risk of accidental fuel and lubricant spills. Project vessels and structures will maintain and adhere to approved Spill, Prevention, Control, and Countermeasure plans as well as the Oil Discharge Prevention and Contingency Plan. These plans include required adherence to NMFS's Pinniped and Cetacean Oil Spill Response Guidelines (NMFS-OPR-52).

6.1.1.6.1 Oil Spill

Oil spills of up to 250 barrels have occurred from offshore platforms in Cook Inlet, and there were four gas blowouts between 1962 and 1987.[38] There have been recent pipeline spills in Cook Inlet, including spills from Hilcorp pipelines; however, none have been large or very large oil spills. Large spills, very large spills, and blowouts are rare and unlikely to occur during the proposed action.

BOEM conducted an oil spill risk analysis for Lease Sale 244 in Cook Inlet and estimated that large condensate and diesel fuel spills would evaporate and disperse generally within 1–10 days, depending on the size of spill (BOEM 2017). A large crude oil spill during the open water season (April-October) was estimated to persist much longer and could cover an estimated discontinuous area of 59 km^2 after 3 days and 1,159 km^2 after 30 days. Broken ice conditions would slow oil spill dispersal; however, oiled ice that drifts and subsequently melts would introduce oil into in new areas (BOEM 2016; BOEM 2017).

The size of the spill influences the number of individuals exposed and the duration of exposure. If a very large oil spill occurred, a large number of marine mammals could be impacted. Impacts could be temporary (e.g., skin irritations or short-term displacement) or permanent (e.g., endocrine impairment or reduced reproduction), depending on the length and means of exposure (e.g., whether oil was directly ingested or indirectly ingested through prey consumption, and the quantity ingested). The presence of oil and increased vessel activity is likely to displace animals, and the impacts may be greater if the spill occurs in a biologically important area.

Contact through the skin, eyes, inhalation, or ingestion could result in temporary irritation or long-term endocrine or reproductive impacts, depending on the duration of exposure. The greatest threat to cetaceans is likely from inhalation of volatile toxic hydrocarbon fractions of fresh oil, which can damage the respiratory system (Hansen 1985; Neff 1990), cause neurological disorders or liver damage (Geraci and St. Aubin 1990), have anesthetic effects (Neff 1990), and cause death (Geraci and St. Aubin 1990). However, toxic fumes from small spills are expected to rapidly dissipate into the atmosphere as fresh refined oil ages quickly, limiting the potential exposure of whales. Ingestion of hydrocarbons can irritate and destroy epithelial cells in the stomach and intestine of marine mammals, affecting motility, digestion, and absorption, which may result in death or reproductive failure (Geraci and St. Aubin 1990). Direct ingestion of oil, ingestion of contaminated prey, or inhalation of volatile hydrocarbons transfers toxins to body fluids and tissues causing effects that may lead to death (Engelhardt 1982; Geraci and St. Aubin 1990; Frost, Manen and Wade 1994; Spraker, Lowry and Frost 1994; Jenssen 1996; Jenssen et al. 1996).

Small spills in upper Cook Inlet are more likely to affect beluga whales, and small spills in the lower Inlet are more likely to affect fin whales, humpback whales, and Steller sea lions. All species would likely be exposed to some degree, if a large oil spill were to occur.

The Cook Inlet beluga whale population is small and resident; any impact from direct or indirect effects from a large oil spill has the potential for population-level impacts (NMFS 2016). A spill in a more centrally located area of beluga habitat would increase exposure and severity of the impact, and recovery of the population could be delayed (NMFS 2016). Belugas could be displaced from affected habitat areas. The loss of nursing/calving habitats could create additional

[38] https://dec.alaska.gov/Applications/SPAR/PublicMVC/PERP/SpillSearch Accessed May 2024.

stresses that may reduce the fitness of some individual belugas over time. If a spill occurred when many beluga calves were present, a substantial portion of that age class cohort could be lost and recruitment and species population growth could take decades to recover. The probability of a large spill occurring is low, and impacts would depend on the size of the spill, the co-occurrence of belugas and the spill, spill response, and the dispersion/weathering of the spill (BOEM 2016).

A large spill could reduce feeding opportunities for fin and humpback whales in lower Cook Inlet, leading to modified distribution of these whales (BOEM 2015b; BOEM 2016). The significance of the loss depends on the whales' ability to meet annual energy demands with other feeding opportunities. Fate, recovery, and availability of zooplankton and fish populations in similar quantities and locations as pre-spill conditions in subsequent years would depend on a variety of factors. Phototoxic effects on copepods could cause ecosystem disruptions, which have not been accounted for in traditional oil spill damage assessments (Duesterloh, Short and Barron 2002). The greatest impact of an oil spill on fin and humpback whales could occur indirectly (BOEM 2016).

Steller sea lions could be adversely affected by a large spill to varying degrees. Inhalation of highly concentrated petroleum vapors can cause inflammation and damage to the mucous membranes of airways, lung congestion, hemorrhagic bronchopneumonia, and pulmonary edema in severe cases (Zieserl 1979). After extreme exposure, asphyxiation may occur (Geraci and St Aubin 1982). Sea lions have haulouts as a resting/escape platform or, water depth and distance for escape routes from an oil spill. Some individuals may detect and avoid oil (Geraci and St. Aubin 1990), but Steller sea lions have also been observed swimming in or near slicks (Calkins et al. 1994). The reduction in quantity and quality of prey species due to an oil spill could result in decreased rates of reproduction or survivorship by reducing individual condition or fitness, or habitat displacement from loss of prey availability (BOEM 2016). While reduction or contamination of food sources would be localized relative to the area of a spill, a very large spill could expose a large number of sea lions to contaminated prey for a sustained amount of time.

Based on the localized nature of small oil spills, the relatively rapid weathering expected for <1,000 barrels of oil, and the safeguards in place to avoid and minimize oil spills, the probability of fin whales, humpback whales, Cook Inlet beluga whales, and Steller sea lions being exposed to a small oil spill is extremely unlikely. If exposure were to occur, NMFS does not expect detectable responses from listed marine mammals due to the ephemeral nature of small oil spills. Large and very large oil spills are extremely unlikely to occur.

6.1.2 Major Stressors on ESA-Listed Species

The following sections analyze the stressors likely to adversely affect ESA-listed species due to underwater anthropogenic sound. Project activities will produce non-impulsive, continuous sounds (i.e., production drilling, tugs towing the jack-up rig). The major acoustic stressor likely to expose listed species to Level A or B acoustic harassment is tugs towing, holding, and positioning the jack-up rig. First we provide a brief explanation of the sound measurements and acoustic thresholds used in the discussions of acoustic effects in this opinion.

6.1.2.1 Acoustic Thresholds

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to marine mammals (70 FR 1871, 1872; January 11, 2005). NMFS has developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary threshold shifts (PTS and TTS) (83 FR 28824; June 21, 2018; 81 FR 51693; August 4, 2016). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels,[39] expressed in root mean square (rms),[40] from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA) (16 U.S.C § 1362(18)(A)(ii)):

- impulsive sound: 160 dB_{rms} re 1 μPa
- non-impulsive sound: 120 dB_{rms} re 1μPa

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds (Table 5) for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (16 U.S.C § 1362(18)(A)(i)) (NMFS 2018). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS 2018). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds and L_E for non-impulsive sounds. The generalized hearing range for each hearing group is in Table 6. Level A harassment radii can be calculated using the optional user spreadsheet[41] associated with NMFS Acoustic Guidance or through modeling.

The MMPA defines "harassment" as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or, (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]" (16 U.S.C. § 1362(18)(A)).

While the ESA does not define "harass", NMFS issued guidance interpreting the term "harass" under the ESA as: to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016).

Exposure to sound capable of causing Level A or Level B harassment under the MMPA often, but not always, constitutes take under the ESA. For the purposes of this consultation, we have determined tugging activities (tugs towing, holding, or positioning the jack-up rig) have sound

[39] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.
[40] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.
[41] The Optional User Spreadsheet can be downloaded from the following website: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm

source levels capable of causing take under the MMPA and ESA.

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance. However, no mortalities or permanent impairment to hearing is anticipated.

Table 5. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2018).

Hearing Group	PTS Onset Acoustic Thresholds[1] (Received Level)	
	Impulsive	**Non-impulsive**
Low-Frequency (LF) Cetaceans	$L_{PK,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{PK,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{PK,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{PK,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{PK,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

[1]Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{PK}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa^{2}s. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Table 6. Underwater marine mammal hearing groups (NMFS 2018).

Hearing Group	ESA-listed Marine Mammals in the Project Area	Generalized Hearing Range[1]
Low-frequency (LF) cetaceans *(Baleen whales)*	Fin whales Mexico DPS humpback whales WNP DPS humpback whales	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans *(dolphins, toothed whales, beaked whales)*	Cook Inlet beluga whales	150 Hz to 160 kHz
High-frequency (HF) cetaceans *(true porpoises)*	None	275 Hz to 160 kHz
Phocid pinnipeds (PW) *(true seals)*	None	50 Hz to 86 kHz
Otariid pinnipeds (OW) *(sea lions and fur seals)*	Western DPS Steller sea lion	60 Hz to 39 kHz

[1]Respresents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

6.2 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and sex of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent.

As discussed in Section 2.1.2 above, Hilcorp proposed mitigation measures that should avoid or minimize exposure of fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions to one or more stressors from the proposed action.

NMFS expects that fin whales, humpback whales, Cook Inlet beluga whales, and Steller sea lions will be exposed to underwater noise from tugs towing, holding, and positioning the jack-up rig.

6.2.1 Ensonified Area

6.2.1.1 Tug Sound Source Level

Hilcorp conducted a literature review of underwater sound emissions from tugs under various loading efforts and found a range from approximately 164 dB rms to 202 dB rms. This range largely relates to the level of operational effort; full power output and higher speeds generate more propeller cavitation, which results in greater sound source levels. Table 7 provides measured sound source levels of tugs of various horsepower (2,000 to 8,200 hp) under loading conditions.

Table 7. Measured tug sound source levels.

Tug Name	Activity*	Speed (kts)	Horsepower (hp)	Source Level (dB re 1 µPa at 1 m)	Reference
Eagle	Towing barge	9.6	6,770	173	Bassett *et al.* 2012
Valor	Towing barge	8.4	2,400	168	
Lela Joy	Towing barge	4.9	2,000	172	
Pacific Eagle	Towing barge	8.2	2,000	165	
Shannon	Towing barge	9.3	2,000	171	
James T Quigg	Towing barge	7.9	2,000	167	
Island Scout	Towing barge	5.8	4,800	174	
Chief	Towing barge	11.4	8,200	174	
Lauren Foss	Berthing barge	N/A	8,200	167	Austin *et al.* 2013
Seaspan Resolution	Berthing at half power	N/A	6,000	180	Roberts Bank Terminal 2 Technical Report 2014
Seaspan Resolution	Berthing at full power	N/A	6,000	200	

*Berthing activities could include tugs either pushing or pulling a load.

The Roberts Bank Terminal 2 Technical Report (2014) includes repeated measurements of the same tug operating under different speeds and loading conditions. The study analyzed 650 tug transits and broadband measurements ranged from approximately 162 dB rms up to 200 dB rms, with a mean tug source level of 179.3 dB rms. Additionally, the source level measured during berthing at half power was 180 dB rms. According to the Hilcorp rig manager, who is experienced with towing jack-up rigs in Cook Inlet, the tugs generally operate at half power or less for the majority of the time they are under load (Durham, pers. comm., 2021). Transits with the tide (lower power output) are preferred for safety reasons, and effort is made to reduce or eliminate traveling against the tide (higher power output).

Based on Hilcorp's literature review, a source level of 180 dB re 1 µPa at 1 m was determined to be an appropriate proxy source level for a single tug under load. During towing activities, the most common configuration is two tugs positioned side by side pulling from the front of the jack-up rig and one tug positioned behind the jack-up rig applying tension on the line as needed for steering and straightening. If all three tugs are operating simultaneously at 180 dB rms, the overall source emission levels are expected to increase by approximately 5 dB to 185 dB rms when logarithmically adding the sources.

JASCO Applied Sciences (JASCO) conducted a sound source verification (SSV) study to measure the sound source levels of three tugs towing the jack-up-rig at various power outputs in Cook Inlet in October 2021 (Lawrence, Warner and Austin 2022). The SSV reported a source level of 167.3 dB rms for the 20 percent power scenario and a source level of 205.9 dB rms for the 85 percent power scenario. Assuming a linear scaling of tug power, a source level of 185 dB rms was calculated as a single point source level for three tugs operating at 50 percent power output. In practice, the load condition of the three tugs is unlikely to be identical at all times, and sound emissions will be dominated by the tug that is working hardest at any point in time.

Modeling was done to account for the fourth tug operating for one hour at 50 percent power during jack-up rig positioning. In terms of acoustic energy, this is equivalent to three tugs each operating at 180.0 dB rms for four hours and a fourth tug joining for one additional hour. The source level increases to 186.0 dB rms for Level B acoustic harassment impacts during the one hour period when all four tugs are under load (the logarithmic sum of four tugs working together at 180.0 dB rms). A SEL of 185.1 dB was used to account for the cumulative sound exposure when calculating for Level A impacts by adding the fourth tug operating at 50 percent power for 20 percent of the estimated five-hour jack-up rig positioning period. This is equivalent in terms of acoustic energy to three tugs operating at 185.0 dB for four hours joined by a fourth tug for one additional hour, and the source level increasing to 186.0 dB during the fifth hour when all four tugs are under load. The use of the 20 percent duty cycle was a computational requirement and, although equal in terms of overall energy and determination of impacts, should not be confused with the actual instantaneous SPL.

In summary, the source level used to calculate the stationary Level B harassment isopleth for three tugs under load for four hours with a 50 percent power output was 185.0 dB rms, and 186.0 dB rms for four tugs are under load for one hour with a 50 percent power output. A source level of 185.1 dB SEL was used to calculate the stationary Level A harassment isopleths where three tugs were underload for four hours and then one tug joined for one additional hour. The mobile Level A and Level B harassment isopleths for three tugs under load with a 50 percent power output were calculated using a source level of 185 dB rms.

The analyses presented below use these sound source levels as they represent the most recent, best available data to estimate potential harassment from tugs operating at 50 percent power output. We describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and transmission loss coefficient. Our analysis focuses on hearing groups of ESA-listed species affected by this action (i.e., low frequency cetaceans, mid-frequency cetaceans, and otariid pinnipeds).

6.2.1.2 Underwater Sound Propagation Modeling for Tugs Towing a Jack-up Rig

Hilcorp contracted SLR Consulting to model the extent of the Level B harassment isopleth as well as the extent of the PTS isopleth for the proposed activity. Cook Inlet is a particularly complex acoustic environment with strong currents, large tides, variable sea floor, and generally changing conditions. Accordingly, a more detailed propagation model than the “practical spreading loss” approach with a factor of 15 was applied in order to improve the representation of the influence of some environmental variables, in particular, bathymetry and specific sound source locations and frequency-dependent propagation effects at the specific well sites.

Modeling was conducted using dBSea software. The fluid parabolic equation modeling algorithm was used with 5 Padé terms to calculate the transmission loss between the source and the receiver at low frequencies (1/3-octave bands, 31.5 Hz up to 1 kHz). For higher frequencies (1 kHz up to 8 kHz), the ray tracing model was used with 1,000 reflections for each ray. Sound sources were assumed to be omnidirectional and modeled as points. The received sound levels for the project were calculated as follows: (1) one-third octave source spectral levels were obtained via reference spectral curves with subsequent corrections based on their corresponding overall source levels; (2) transmission loss was modeled at one-third octave band central frequencies along 100 radial paths at regular increments around each source location out to the maximum range of the bathymetry data set or until constrained by land; (3) the bathymetry variation of the vertical plane along each modeling path was obtained via interpolation of the bathymetry dataset which has 83 m grid resolution; (4) the one-third octave source levels and transmission loss were combined to obtain the received levels as a function of range, depth, and frequency; and, (5) the overall received levels were calculated at a 1-m depth resolution along each propagation path by summing all frequency band spectral levels.

6.2.1.2.1 Model Inputs and Results

Bathymetry data used in the model was collected from the NOAA National Centers for Environmental Information (AFSC 2019). Using temperature and salinity data from NOAA, sound speed profiles were computed using the Mackenzie Equation (1981) for depths from 0 to 100 meters for May, July, and October. Geoacoustic parameters were also incorporated into the model and were based on substrate type and their relation to depth. The locations used in the stationary and mobile source models are depicted in Figure 15.

Detailed broadband sound transmission loss modeling in dBSea used the source level of 185 dB re 1 µPa at 1 m calculated in one-third octave band levels (31.5 Hz to 64,000 Hz) for frequency dependent solutions. The frequencies associated with tug sound sources occur within the hearing range of marine mammals in Cook Inlet. Received levels for each hearing marine mammal group based on one-third octave auditory weighting functions were also calculated and integrated into the modeling scenarios of dBSea.

The tugs towing the jack-up rig represent a mobile sound source, and tugs positioning the jack-up rig on a platform are more akin to a stationary sound source. In addition, three tugs are used for towing (mobile), and holding and positioning (stationary); up to four tugs may be used for positioning (stationary). Consequently, sound TL modeling was undertaken for the various stationary and mobile scenarios to generate Level A and Level B harassment threshold distances.

For acoustic modeling of the stationary Level A harassment thresholds, two locations in middle Cook Inlet were selected as being representative of where the tugs will be stationary while positioning the jack-up rig: near the Tyonek platform and in lower Trading Bay where the production platforms are located. For the mobile scenarios, the acoustic model generated Level A and Level B harassment thresholds along a representative route from the Rig Tenders dock in Nikiski to the Tyonek platform then on to the Dolly Varden platform in lower Trading Bay, and finally back to the Rig Tenders Dock. The locations represent a range of water depths from 18 to 77 m found throughout the project area. The specific route is not yet known, as the order in which platforms will be drilled with the jack-up rig is not yet known.

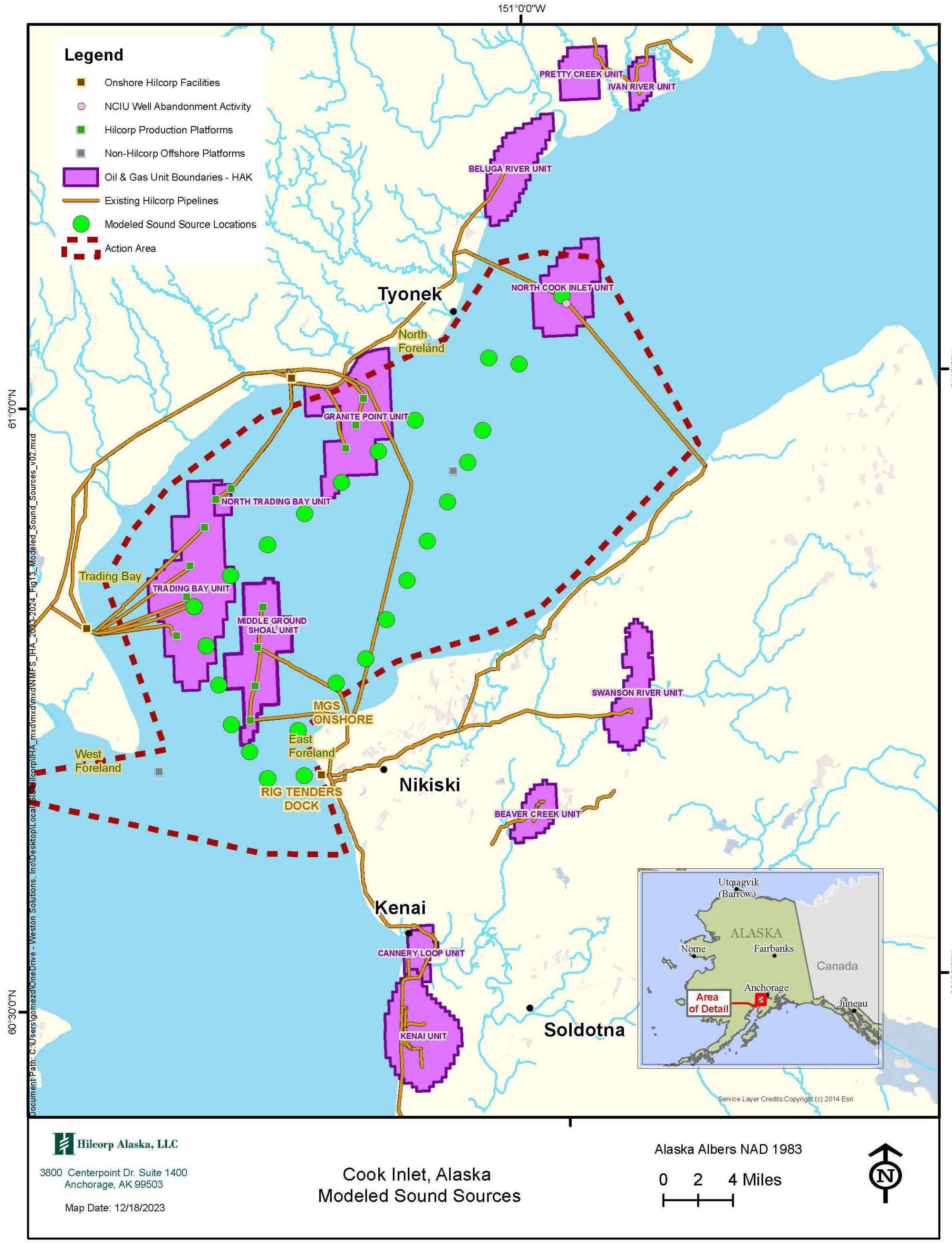

Figure 15. Locations used for mobile and stationary isopleth models.

The average distance to the 120 dB threshold for mobile and stationary Level B harassment with three tugs was based on an assessment of 100 radials at 25 locations (Figure 15) across seasons, and was determined to be 3,850 m (Table 8). For four tugs used during positioning, the average distance to the 120 dB threshold for Level B harassment was based on 100 radials at two locations across seasons, and was determined to be 4,453 m (Table 9).

Table 8. Average distances to the Level B harassment threshold for three tugs towing (mobile) and positioning for four hours (stationary).

Location	Distance (m)			Average distance (m)
	May	July	October	
M1	4,215	3,911	4,352	4,159
M2	3,946	3,841	4,350	4,046
M3	4,156	3,971	4,458	4,195
M4	4,040	3,844	4,364	4,083
M5	4,053	3,676	4,304	4,011
M6	3,716	3,445	3,554	3,572
M7	2,947	2,753	2,898	2,866
M8	3,270	3,008	3,247	3,175
M9	3,567	3,359	3,727	3,551
M10	3,600	3,487	3,691	3,593
M11	3,746	3,579	4,214	3,846
M12	3,815	3,600	3,995	3,803
M13	4,010	3,831	4,338	4,060
M14	3,837	3,647	4,217	3,900
M15	3,966	3,798	4,455	4,073
M16	3,873	3,676	4,504	4,018
M18	5,562	3,893	4,626	4,694
M20	5,044	3,692	4,320	4,352
M22	4,717	3,553	4,067	4,112
M24	4,456	3,384	4,182	4,007
M25	3,842	3,686	4,218	3,915
M26	3,690	3,400	3,801	3,630
M27	3,707	3,497	3,711	3,638
M28	3,546	3,271	3,480	3,432
M29	3,618	3,279	3,646	3,514
Average	**3,958**	**3,563**	**4,029**	**3,850**

Table 9. Average distances to the Level B harassment threshold for four tugs positioning for one hour (stationary).

Location	Distance (m)			Average distance (m)
	May	July	October	
Trading Bay	4,610	3,850	4,810	4,423
Middle CI	4,820	4,130	4,500	4,483
Average	**4,715**	**3,990**	**4,655**	**4,453**

A SEL of 185.1 dB was used when calculating the average Level A harassment distances for the stationary four-tug, five-hour exposure duration scenario (Table 10). For the mobile three-tug scenario, the average Level A harassment distances were calculated assuming a SEL of 185.0 dB with an 18-second exposure period. This 18-second exposure period was derived using the standard TL equation (Source Level − TL = Received Level) for determining threshold distance (R [m]), where TL = 15Log10. In this case, the equation was 185.0 dB − 15Log10 = 173 dB. Solving for the threshold distance (R) yields a distance of approximately six meters, which was then used as the preliminary ensonified radius to determine the duration of time it would take for the ensonified area of the sound source traveling at a speed of 2.06 m/s (4 knots) to pass a marine mammal. The duration (twice the radius divided by speed of the source) that the ensonified area of a single tug would take to pass a marine mammal under these conditions is six seconds. An 18-second exposure was used in the model to reflect the time it would take for three ensonified areas (from three consecutive individual tugs) to pass a single point that represents a marine mammal. The model results show that tugs under load as a mobile sound source do not reach Level A harassment for the LF and MF cetaceans or otariid hearing groups for an 18-second exposure.

Table 10. Average distances to the Level A harassment threshold with a five-hour exposure to four stationary tugs under load with the jack-up rig.

Location	Season	Distance (m)		
		LF Cetaceans	MF Cetaceans	Otariids*
Trading Bay	May	107	77	--
Trading Bay	July	132	80	--
Trading Bay	October	105	75	--
Middle Cook Inlet	May	86	85	--
Middle Cook Inlet	July	95	89	--
Middle Cook Inlet	October	82	86	--
Average		**102**	**82**	**0**

* The Level A harassment distances are smaller than the footprint of the tugs.

6.2.1.3 Calculation of Areas of Ensonification

For the one planned move between platforms, the three tugs towing the jack-up rig are considered a mobile sound source for six hours in a single day. During demobilization in 2024 and mobilization in 2025 to/from the Rig Tenders Dock, the three tugs towing the jack-up are considered a mobile sound source for nine hours in a single day for each of those two moves. The tugs are considered a stationary sound source while holding or positioning the jack-up rig at the platforms or Rig Tenders Dock for five hours in the first day and five hours the second day, if the first attempt to pin the jack-up rig is unsuccessful.

The ensonified area for a move between two production platforms in middle Cook Inlet and/or Trading Bay includes six mobile hours over an average distance of 16.77 km in a single day, and five stationary hours on the first day and five stationary hours on the second day. During the stationary periods, three tugs will be under load for four hours and four tugs will be under load for one hour.

The ensonified area for demobilization and mobilization to/from the Rig Tenders Dock to/from a production platform in middle Cook Inlet includes nine mobile hours over a distance of up to 64.34 km in a single day, and five stationary hours on the first day and five stationary hours on the second day. As described for the between platforms move, three tugs will be under load for four hours and four tugs will be under load for one hour during the stationary periods. A summary of the estimated Level A and Level B harassment threshold distances and areas of ensonification for the various tugging scenarios is provided in Table 11 and Table 12.

Table 11. Level A and Level B harassment thresholds for stationary and mobile tugs under load.

Activity		Level A Harassment (m)			Level B Harassment (m)
		LF Cetaceans	MF Cetaceans	Otariids*	
Mobile	3 tugs towing a jack-up rig	--*	--*	--*	3,850
Stationary for up to 4 hours	3 tugs holding/positioning a jack-up rig	102	82	--*	3,850
Stationary for up to 1 hour	4 tugs holding/positioning a jack-up rig	102	82	--*	4,453

*The Level A harassment distances are smaller than the footprint of the tugs.

Table 12. Areas of ensonification for stationary and mobile tugs under load.

Activity			Level A Harassment (km^2)			Level B Harassment (km^2)
			LF Cetaceans	MF Cetaceans	Otariids	
Demobilization/ Mobilization	Mobile	3 tugs towing	--*	--*	--*	541.96
	Stationary (4 hours)	3 tugs holding/positioning	0.03	0.02	--*	46.56
	Stationary (1 hour)	4 tugs holding/positioning	0.03	0.02	--*	62.30
Location-to-Location	Mobile	3 tugs towing	--*	--*	--*	175.67
	Stationary (4 hours)	3 tugs holding/positioning	0.03	0.02	--*	46.56
	Stationary (1 hour)	4 tugs holding/positioning	0.03	0.02	--*	62.30

*The Level A areas of ensonification are smaller than the footprint of the tugs.

6.2.2 Marine Mammal Occurrence

The following outlines the best available information about the occurrence of marine mammals used to calculate exposure estimates. Densities for marine mammals in Cook Inlet were derived from the NMFS Cook Inlet beluga whale aerial surveys conducted from 2000 to 2022 (Rugh et al. 2005; Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2017; Shelden and Wade 2019; Shelden et al. 2022; Goetz et al. 2023). While the surveys are typically conducted biennially during a two-week period in June and focus on belugas, they represent the best available long-term dataset of marine mammal sightings in Cook Inlet. Density was calculated by summing the total number of animals observed and dividing the number sighted by the area surveyed. The total number of animals observed accounts for both lower and upper Cook Inlet. Average densities across survey years are presented in Table 13.

For belugas, the Goetz et al. (2012) habitat-based model and the NMFS Cook Inlet beluga whale aerial surveys described above were considered. Several correction factors were applied to the beluga survey sighting data to address perception, availability, and proximity bias. The corrected beluga sightings totals were then divided by the area surveyed to calculate density values for the entirety of Cook Inlet, as well as for middle and lower Cook Inlet. The middle Cook Inlet density was used to calculate exposure estimates. There is a known effect of seasonality on the distribution of the belugas and densities derived directly from these summer surveys likely underestimate the density of beluga whales in lower Cook Inlet at other ice-free times of the year.

The Goetz et al. (2012) habitat-based model is derived from sightings prior to 2012 and incorporates depth soundings, coastal substrate type, environmental sensitivity index, anthropogenic disturbance, and anadromous fish streams to predict densities throughout Cook Inlet. The model output is a map of spatially explicit Cook Inlet beluga density estimates. Using the resulting grid densities, average densities were calculated for two regions applicable to Hilcorp's operations. The North Cook Inlet density for middle Cook Inlet activities and the Trading Bay density for activities in Trading Bay were carried forward to the exposure estimates (Table 13). When a range was provided, the higher end of the range was used to calculate exposure estimates (e.g., the Goetz model indicates a range of 0.004453 to 0.015053 for Trading Bay; 0.015053 was used for the exposure estimates).

Table 13. Average densities of marine mammal species in Cook Inlet.

Species	Density (individuals/km^2)
Fin whale	0.000280
Humpback whale	0.001850
Beluga whale (NMFS surveys middle Cook Inlet)	0.006580
Beluga whale (Goetz - North Cook Inlet)	0.001664
Beluga whale (Goetz - Trading Bay)	0.015053
Steller sea lion	0.006690

6.2.3 Exposure Estimates

This section outlines how exposure estimates were calculated using the acoustic harassment thresholds and marine mammal density information provided above.

The jack-up rig is expected to be moved three times over the course of six days (one two-day location-to-location move, one two-day demobilization, and one two-day mobilization). Hilcorp estimated six hours of mobile (towing) and five hours of stationary (holding and positioning) activities on the first day, and five hours of the stationary activity on the second day (to account for two positioning attempts for the location-to-location move). For demobilization and mobilization, Hilcorp estimated nine hours of mobile and five hours of stationary activities on the first day, and five hours of stationary activities on the second day for each move (a total of four days of tugging activities). During all five-hour stationary periods, it is expected that three tugs will be under load for four hours and four tugs will under load for one hour.

The Level A and Level B ensonified areas per tugging activity scenario for each functional hearing group were multiplied by the estimated marine mammal densities to estimate the number of exposures per day. This value was then multiplied by the number of days per move and the number of moves of that type of activity scenario. The estimated exposures by activity scenario were then summed to provide the number of exposures for all tugging activities. The Level A thresholds for low frequency cetaceans, mid-frequency cetaceans, and otariids were smaller than the footprint of the tugs for three tugs towing the jack-up rig (mobile). For stationary holding and/or positioning of the jack up rig with three or four tugs, the Level A isopleths are calculated based on the assumption that an animal would remain within close proximity of the jack-up rig for the full five hour duration of sound-producing activity. The action area is not known, or expected to be, habitat likely to be used continuously by any listed marine mammal, and Level A exposure from tugging activity is not expected.

Table 14 summarizes the calculated Level B harassment exposures for each listed species.

The calculated number of exposures are based on density estimates from the NMFS Cook Inlet beluga aerial surveys. The survey methodology was designed to capture beluga distribution and abundance, and does not adequately gather data on large cetacean or Steller sea lion abundance in Cook Inlet. The aerial surveys focus on the coastal habitat where belugas are more likely to be present, which introduces bias for density estimates of more pelagic species. Correction factors for missed animals due to availability bias, perception bias, observer bias, etc., were also only calculated for, and applied to, belugas. Additionally, density estimates assume uniform distribution across an area and do not account for the fact that many marine mammals travel in groups. NMFS considered these limitations as well as evaluated sightings and group sizes during marine mammal monitoring efforts and research surveys to determine if the calculated exposure estimates for each species should be adjusted.

Table 14. Summary of parameters and calculated Level B exposures.

Activity			Area Ensonified	Level B Harassment Exposures			
				Fin Whale	Humpback Whale	Beluga Whale	Steller Sea Lion
Demobilization/ Mobilization	Mobile	3 tugs towing	541.96	0.299	2.001	7.133	7.253
	Stationary (4 hours)	3 tugs holding/positioning	46.56	0.009	0.057	0.204	0.208
	Stationary (1 hour)	4 tugs holding/positioning	62.30	0.003	0.019	0.068	0.069
Location-to-Location	Mobile	3 tugs towing	175.67	0.048	0.324	1.900	1.175
	Stationary (4 hours)	3 tugs holding/positioning	46.56	0.004	0.029	0.168	0.104
	Stationary (1 hour)	4 tugs holding/positioning	62.30	0.001	0.010	0.056	0.035
Total Calculated Level B Harassment Exposures				**0.364**	**2.440**	**9.529**	**8.844**

Fin Whale

Fin whales are rarely observed in Cook Inlet and most sightings occur near the entrance of the inlet. NMFS Cook Inlet beluga whale aerial surveys recorded 10 sightings of 28 fin whales in lower Cook Inlet between 1993 and 2022 (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). Fin whales were most often observed traveling alone or in pairs; however, a group of 3 and 13 individuals were recorded. During Hilcorp seismic operations in lower Cook Inlet in fall 2019, eight sightings of 23 fin whales were observed in groups ranging in size from one to 15 individuals (Fairweather Science 2020). This higher number of sightings in a single year indicates fin whales may be present in greater numbers than previously estimated, particularly during the fall period. Based on these observations, NMFS expects that two fin whales could be exposed to Level B harassment from noise generated by tugs towing, holding, or positioning the jack-up rig. This is more than the calculated Level B exposure estimate of 0.364 whales, and accounts for one group of two whales or two observations of single animals. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed.

Mexico and WNP DPS Humpback Whale

Humpback whales have been observed throughout Cook Inlet, but are primarily found in the lower inlet. The NMFS Cook Inlet beluga whale aerial surveys recorded 97 sightings of 211 humpbacks between 1993 and 2022; all were located in lower Cook Inlet (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). Group sizes ranged from one to 12 individuals, with most groups comprised of one to three individuals (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022). There were 14 sightings of 38 humpback whales, with group sizes ranging from one to 14 animals, during Hilcorp seismic operations in lower Cook Inlet in fall 2019 (Fairweather Science 2020).

Farther north in Cook Inlet, two humpbacks were observed north of the Forelands during marine mammal monitoring in May and June of 2015 (Jacobs Engineering Group 2017). Marine mammal monitoring near the mouth of Ship Creek also recorded two humpback whale sightings, likely of the same individual, in September 2017 (ABR 2017). Two sightings totaling three humpback whales were recorded near Ladd Landing, north of the Forelands, in 2018 during marine mammal monitoring for the Harvest Alaska CIPL project (Sitkiewicz et al. 2018). One humpback was observed in July 2022 during transitional dredging at the Port of Alaska (61 North Environmental 2022b). Deceased humpbacks were reported in upper Cook Inlet in 2015, 2017, and 2019.

Humpback whales are uncommon in the action area and few, if any, are expected. Sightings from the CIPL project are closest to the action area and based on these observations as well as the calculated exposure estimate, NMFS expects that three humpback whales could be exposed to Level B harassment from noise generated by tugs towing, holding, or positioning the jack-up rig. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed. In Cook Inlet, 11 percent of humpback whales are expected to be from the ESA-listed Mexico DPS and less than 1 percent are expected to be from the ESA-listed WNP DPS (Wade 2021). Therefore, NMFS expects that a fraction of one individual, rounded up to one individual, from the Mexico or WNP DPS may be exposed to Level B harassment from noise generated by tugs towing, holding, or positioning the jack-up rig.

Cook Inlet Beluga Whale

Distribution data, including data from aerial surveys and acoustic monitoring, indicate that the beluga range in Cook Inlet has contracted markedly (Shelden et al. 2015b; Shelden and Wade 2019); almost the entire population is currently found only in northern Cook Inlet from late spring into the fall. During the Harvest Alaska CIPL project in 2018, observers based on the Tyonek Platform and onshore at Ladd Landing reported 143 sightings of 814 belugas between May and August (Sitkiewicz et al. 2018).

The area around the East Forelands between Nikiski, Kenai, and Kalgin Island appears to provide important habitat in winter, early spring, and fall. Recent monitoring efforts indicate beluga presence near the Kenai and Kasilof rivers from fall to spring (Ovitz 2019; Castellote et al. 2020; Kumar, Castellote and Gill 2024).[42] Beluga groups were observed in the upper inlet as well as the Kenai and Kasilof rivers, Tuxedni Bay, and near Kalgin Island in the lower inlet during aerial surveys conducted in early spring and late autumn between 2018 and 2021 (NMFS 2022).

The NMFS Cook Inlet beluga whale aerial survey conducted in 2018 reported a median beluga group size estimate of approximately 11 whales. The estimated group sizes were highly variable (ranging from 2 to 147 whales), as was the case in previous survey years (Shelden and Wade 2019). The median group size during 2021 and 2022 aerial surveys was 34 and 15 whales, respectively, with group sizes between 1 and 174 whales between the two years (Goetz et al. 2023). Additionally, vessel-based surveys conducted in 2019 recorded group sizes of 5 to 200 belugas in the Susitna River Delta, which is roughly 24 km north of the Tyonek Platform.[43] Large groups are not expected near Hilcorp's platforms; however, smaller groups could be traveling through the action area to access the Susitna River Delta and other nearby coastal locations, particularly in the shoulder seasons when belugas are more likely to occur outside of the upper inlet. Based on these observations, NMFS expects that 15 beluga whales could be exposed to Level B harassment from noise generated by tugs towing, holding, or positioning the jack-up rig. This is more than the calculated Level B exposure estimate of approximately 9.5 whales, and accounts for one group of 15 whales, the 2022 median group size, or multiple observations of smaller-sized groups. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed.

Western DPS Steller Sea Lion

Sightings of Steller sea lions in upper and middle Cook Inlet are uncommon. Projects at the Port of Alaska in upper Cook Inlet have recorded several Steller sea lion sightings in recent years. There were six Steller sea lion sightings in 2020 (61 North Environmental 2021) and nine in 2021(61 North Environmental 2022a; Easley-Appleyard and Leonard 2022) during marine

[42] https://akbmp.org/beluga-observation-log/ accessed January 2024.
[43] https://www.cookinletbelugas.com/_files/ugd/af2fcb_a4ab03d26cc1432983ca5132a36be690.pdf accessed May 2024.

mammal monitoring efforts associated with the Petroleum and Cement Terminal Project. Three Steller sea lions were observed in 2022 during monitoring for the South Floating Dock construction (61 North Environmental 2022c).

There have also been sightings of small numbers of Steller sea lions during oil and gas projects farther south in Cook Inlet. During the SAExploration 3D seismic program in 2015, one sighting occurred northeast of North Foreland, one between the East and West Forelands, and one near Nikiski (Kendall et al. 2015). Observers recorded one sighting of two Steller sea lions near Ladd Landing during the Harvest Alaska CIPL project in 2018 (Sitkiewicz et al. 2018). Five Steller sea lions were observed in 2019 during Hilcorp seismic operations in lower Cook Inlet (Fairweather Science 2020). 2018). During a waterfowl survey in 2022, an estimated 25 Steller sea lions were observed hauled-out at low tide in the Lewis River on the west side of Cook Inlet (K. Lindberg, pers. comm., August 15, 2022). NMFS Cook Inlet beluga whale aerial surveys recorded 64 sightings of 1,111 Steller sea lions between 1993 and 2022; the majority were located south of the Forelands (Shelden et al. 2013; Shelden et al. 2015a; Shelden et al. 2022).

Commensurate with the calculated exposure estimate shown in Table 14, NMFS expects that nine Western DPS Steller sea lions could be exposed to Level B harassment from noise generated by tugs towing, holding, or positioning the jack-up rig. Here we assume that if an animal is present in the ensonified area, it will be exposed to acoustic harassment, acknowledging that not all animals within the action area will be so exposed.

Table 15 summarizes the estimated exposures of fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions to noise generated by tugs towing, holding, and positioning the jack-up rig.

Table 15. Calculated and adjusted exposures of ESA-listed species.

Species	Level A	Level B	
		Calculated Exposures	**Adjusted Exposures**
Fin whale	0	0.364	2
Humpback whale *(Mexico and WNP DPS)*	0	2.440 *(0.029)*	3 *(1)*
Cook Inlet beluga whale	0	9.529	15
Western DPS Steller sea lion	0	8.844	9

6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, response analyses determine how listed species are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions to the sounds produced by project activities include:

- Temporary or permanent hearing impairment (threshold shifts)
- Non-auditory physiological effects
- Behavioral responses
- Auditory interference (masking)

6.3.1 Responses to Major Noise Sources (Tugging Activities)

As described in the Exposure Analysis, fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions are expected to occur in the action area and to overlap with noise associated with tugs towing, holding, and positioning the jack-up rig. We assume that some individuals are likely to be exposed and respond to these noise sources.

The Level A thresholds for low frequency cetaceans, mid-frequency cetaceans, and otariids were smaller than the footprint of the tugs for three tugs towing the jack-up rig. For stationary holding and/or positioning of the jack up rig with three or four tugs, the Level A isopleths are calculated based on the assumption that an animal would remain within close proximity of the tugs and jack-up rig for the full five hour duration of sound-producing activity. Additionally, the mitigation measures described in Section 2.1.2 will be implemented to minimize impacts. We do not expect that any listed marine mammals will be exposed to noise levels loud enough, long enough, or at distances close enough for the proposed action to result in harm to the animal. In other words, we expect no permanent hearing impairment (e.g., PTS) or other injury. We expect no more than two exposures of fin whales, one exposure of Mexico or WNP DPS humpback whales, 15 exposures of Cook Inlet beluga whales, and nine exposures of Western DPS Steller sea lions to noise levels sufficient to cause harassment, as described in Section 6.2.3. All instances of harassment are expected to occur at received levels greater than 120 dB for non-impulsive noise sources, meaning some physical and behavioral responses could occur.

The introduction of anthropogenic noise into the aquatic environment from tugs towing, holding, and positioning the jack-up rig is the primary means by which marine mammals may be harassed from project activities covered in this opinion. In general, animals exposed to natural or anthropogenic sound may experience physical and physiological effects, ranging in magnitude from none to severe (Southall et al. 2007). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in marine mammal habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection.

Exposure to noise from tugs towing, holding, and positioning the jack-up rig has the potential to result in auditory threshold shifts and behavioral reactions. The effects of noise from tugging activities on marine mammals are dependent on several factors, including, but not limited to, the species, age and sex class, duration of exposure, the distance between the activity and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok et al. 2003; Southall et al. 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects.

6.3.1.1 Threshold Shifts

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018e). In other words, a threshold shift is a hearing impairment, and may be temporary (such as ringing in your ears after a loud rock concert) or permanent (such as the loss of the ability to hear certain frequencies or partial or complete deafness). There are numerous factors to consider when examining the consequence of TS, including: the signal's temporal pattern (e.g., impulsive or non-impulsive); likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS; the magnitude of the TS; time to recovery; the frequency range of the exposure (i.e., spectral content); the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (i.e., how an animal uses sound within the frequency band of the signal; Kastelein et al. 2014); and, the overlap between the animal and the sound (e.g., spatial, temporal, and spectral; NMFS 2018e). The amount of threshold shift is customarily expressed in dB.

Temporary Threshold Shift

Temporary threshold shift (TTS) is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1970). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the sound ends. Few data exist on the sound levels and durations necessary to elicit mild TTS in marine mammals, and none of the published data describe TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in (Southall et al. 2007).

Although some exposures to sound capable of causing harassment may occur during the course of the proposed action, not all instances will result in TTS because the estimated noise thresholds for the onset of TTS are conservative. If TTS does occur, it is expected to be mild and temporary, and not likely to affect the long-term fitness of the affected individuals.

Permanent Threshold Shift

When permanent threshold shift (PTS) occurs, there is physical damage to the sound receptors in the ear. The animal will have an impaired ability to hear sounds in specific frequency ranges, and there can be total or partial deafness in severe cases (Kryter 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals will incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing the onset of TTS might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on anatomical similarities. PTS might occur at a received sound level at least several decibels above that which induces mild TTS, if the animal were exposed to strong sound pulses with rapid rise time. For non-impulsive exposures, a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is, therefore, considered equivalent to PTS onset (NMFS 2018e). We do not expect listed species to experience PTS from the proposed action.

6.3.1.2 Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, internal bubble formation, resonance effects, and other types of organ or tissue damage (Cox et al. 2006; Southall et al. 2007). Studies examining such effects are limited. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall et al. 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of strong underwater sounds are especially unlikely to incur auditory impairment or non-auditory physical effects.

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 (Moberg 2000). In many cases, an animal's first, and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

The primary distinction between stress, which is adaptive and does not normally place an animal at risk, and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (Jessop et al. 2003; Lankford et al. 2005; Crespi et al. 2013). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano et al. 2002) and, more rarely, studied in wild populations (Romano et al. 2002). For example, noise reduction from reduced ship traffic in the Bay of Fundy following September 11, 2001 was linked to a significant decline in fecal stress hormones in North Atlantic right whales, suggesting that chronic exposure to increased noise levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These stress hormones returned to their previous level within 24 hours after the resumption of shipping traffic. Exposure to loud noise can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

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).

The proposed action may result in ESA-listed species experiencing stress responses. However, the jack-up rig is expected to be moved three times over the course of six days during a one-year period, thus limiting the potential for chronic stress. Marine mammals that show behavioral avoidance of the tugging activities are especially unlikely to incur auditory impairment or non-auditory physical effects, like stress and distress, because they will be further limiting the duration of their exposure. If listed marine mammals are not displaced and remain in the stressful environment (within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor.

6.3.1.3 Behavioral Disturbance Reactions

Behavioral responses are influenced by an animal’s assessment of whether a potential stressor poses a threat or risk. Behavioral responses may include: changing durations of surfacing and dives, number of blows per surfacing, or changing direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or, flight responses.

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific, and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Southall et al. 2007).

Tolerance 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 tolerate, and possibly habituate to, sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; NRC 2003; Wartzok et al. 2003).

The biological significance of behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be biologically significant if the change affects growth, survival, or fitness. Significant behavioral modifications that could potentially lead to effects on growth, survival, or fitness include drastic changes in diving/surfacing patterns, longer-term habitat abandonment due to loss of desirable acoustic environment, longer-term cessation of feeding or social interaction, and cow/calf separation.

Hilcorp has used a multi-tug configuration to tow, hold, and position a jack-up rig in Cook Inlet since 2021. Monitoring efforts during the transport have documented a small number of harbor porpoise and harbor seal sightings. Typical behaviors (swimming, traveling, diving, etc.) for these species were recorded and no significant behavior changes or reactions to project activities were recorded. The sightings data indicate the animals had no reaction to project activities or some harbor seals were observed looking in the direction of the activity. It is not apparent if tugs towing, holding, or positioning the jack-up rig cause harassment to the extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering (Wieting 2016).

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography), and is difficult to predict (Southall et al. 2007).

6.3.1.4 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance or fitness in survival and reproduction. If the coincident masking sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but may result in a behavioral effect.

Masking occurs at the frequency band the animal utilizes, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. Anthropogenic sounds may also affect communication signals when both occur in the same sound band and thus reduce the communication space of animals (Clark et al. 2009; Eickmeier and Vallarta 2023), and cause increased stress levels (Foote, Osborne and Hoelzel 2004; Holt et al. 2009).

Masking has the potential to affect species at the population or community levels, as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Research suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than a three-fold increase in terms of SPL) in the world's ocean from pre-industrial periods, and that most of these increases are from distant shipping (Hildebrand 2009). All anthropogenic sound sources, such as those from project activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Noise from tugging activities may mask acoustic signals important to fin whales, humpback whales, beluga whales, and Steller sea lions. However, tugging activities will be intermittent (occurring over the course of six days during a one-year period) and affect a limited area. Masking only exists for the duration of time that the masking sound is emitted and interfering with biologically important sounds; extended periods of time where masking could occur are not expected.

Masking is likely less of a concern for Steller sea lions, which vocalize both in air and water and do not echolocate or communicate with complex underwater "songs". Any masking event that could harass sea lions would occur concurrently within the zones of behavioral harassment already estimated for tugging activities, which have already been taken into account in the Exposure Analysis.

6.3.2 Response Analysis Summary

The reactions and behavioral changes described above are expected to be temporary and subside quickly when the exposure ceases. The primary mechanism by which these behavioral changes may affect the fitness of individual animals is through the animals' energy budget, time budget, or both; the two are related because foraging requires time. Some animals may leave the area during project activities if they were disturbed, and high-quality habitat is located throughout Cook Inlet. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of fin whales, humpback whales, beluga whales, or Steller sea lions, and their probable exposure to noise sources are not likely to reduce their fitness.

7 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area (50 CFR § 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult, if not impossible, to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the Status of the Species and the Environmental Baseline sections.

We searched for information on non-Federal actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline section and those summarized below. Reasonably foreseeable future state, local, or private actions include vessel traffic and shipping, state fisheries, pollution, and tourism, and are discussed in the following sections.

7.1 Vessel Traffic and Shipping

Vessel traffic, including shipping, is expected to continue in Cook Inlet. It is unknown whether overall vessel traffic or shipping will increase in the future, as this depends largely on population growth, economics, tourism, and other factors, but it is unlikely to decrease significantly. As a result, there will be continued risk to marine mammals of ship strikes, exposure to vessel noise and presence, and small spills.

7.2 Fisheries (State of Alaska Managed)

ADFG manages fish stocks and monitors and regulates fishing under the state jurisdiction in Cook Inlet to maintain sustainable stocks. Fishing, a major industry in Alaska, is expected to continue in the area. As a result, there will be continued risk to marine mammals of prey competition, ship strikes, harassment, and entanglement in fishing gear. For Cook Inlet beluga whales, there is also a risk of continued displacement from former summer foraging habitat due to human activity associated with salmon harvest (Ovitz 2019). It remains unknown whether and to what extent marine mammal prey may become less available due to commercial, subsistence, personal use, and sport fishing, especially near the mouths of streams that salmon and eulachon migrate up to spawning areas. In addition, we do not know the full extent of the effects of fishing vessel traffic on availability of prey to belugas. The Cook Inlet Beluga Whale Recovery Plan considers reduction in availability of prey due to activities such as fishing to be a moderate threat to the population (NMFS 2016).

7.3 Pollution

As the human population in urban areas around Cook Inlet continues to grow, an increase in pollutants entering Cook Inlet is likely to occur. Hazardous materials are released into Cook Inlet from vessels, aircraft, and municipal runoff. Oil spills could occur from vessels traveling within the action area. In addition, oil spilled from outside the action area could migrate into the action area. There are many nonpoint sources of pollution within the action area. Pollutants can pass from streets, construction and industrial areas, and airports into Cook Inlet. The EPA and the ADEC will continue to regulate the amount of pollutants that enter Cook Inlet from point and nonpoint sources through NPDES/APDES permits. As a result, permittees will be required to renew their permits, verify they meet permit standards, and potentially upgrade facilities.

7.4 Tourism

Currently there are no commercial whale-watching companies in upper Cook Inlet. The extremely hazardous environmental and boating conditions, lack of harbors, and single boat launching facility that cannot be used at low tides in the Anchorage area, make it unlikely that commercial whale-watching will occur in the area. However, some aircraft have circled groups of Cook Inlet beluga whales, disrupting their breathing patterns and possibly their feeding activities. In response, NMFS has undertaken outreach efforts to educate local pilots of the potential consequences of such actions, providing guidelines and encouraging pilots to “stay high and fly by”. Charter and tour vessels operating in lower Cook Inlet, primarily in the vicinity of Homer, could potentially affect the behavior of fin and humpback whales encountered.

Belugas have been observed to exhibit avoidance reactions when approached by watercraft, particularly small, fast-moving vessels that maneuver quickly and unpredictably; larger vessels that do not alter course or speed often cause little to no reaction in Cook Inlet belugas (NMFS 2008a). Watercraft, primarily sport fishing watercraft, have the potential to disturb belugas in areas such as Twentymile River, and NMFS is cooperating with partners to assess the degree to which such boating activities may be a cause for concern due to the associated reduced access to concentrations of prey.

Watercraft regularly approach Western DPS Steller sea lion haulouts located near Homer, but it is unknown if such marine mammal viewing adversely affects the animals.

8 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS’s assessment of the risk posed to species and/or critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency’s biological opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of both the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through direct or indirect alterations that appreciably diminish the value of designated critical habitat as a whole for the conservation of the species. For this opinion we only consider effects to the species mentioned above. These assessments are made in full consideration of the status of the species (Section 4).

As we discussed in the *Approach to the Assessment* section of this opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

As part of our risk analyses, we identified and addressed all potential stressors and considered all consequences of exposing listed species to all the stressors associated with the proposed action, individually and cumulatively, given that the individuals in the action area for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range.

Our analysis in this opinion focuses on project activities (tugs towing, holding, and positioning a jack-up rig, production drilling, vessel support operations, and aircraft support operations) proposed to occur over a 12-month period; however, we recognize that some of these activities may continue into the future (e.g., 30 years). The proposed action is not expected to increase Hilcorp's future oil and gas production, and aircraft support operations, vessel support operations, and other platform operations are not expected to increase outside of the drilling season. Activities associated with production operations are likely to continue and we expect Hilcorp to continue to operate in a similar manner.

8.1 Fin Whale and Mexico and WNP DPS Humpback Whale Risk Analysis

Based on the results of the exposure analysis, we expect two fin whales and three humpback whales may be exposed to noise from tugs towing, holding, and positioning the jack-up rig. For humpback whales in the action area, 11 percent are expected to be from the Mexico DPS and less than one percent are expected to be from the WNP DPS, resulting in exposure of one ESA-listed humpback to project sound capable of causing harassment. The action area is not regularly used by fin whales or humpback whales, which is the strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on populations or individuals from these two species.

Exposure to noise from non-tugging activities (production drilling, vessel and aircraft support operations), marine debris, seafloor disturbance, and small oil spills may occur, but such exposure would have a very small impact, and are not expected to result in take of fin whales or humpback whales. Impacts from noise associated with non-tugging activities are expected to be undetectable or minor due to the low density of these species in the area, short duration of spatial overlap, low likelihood of exposure to sound that could significantly disrupt behavioral patterns, and implementation of mitigation measures. Trash will be disposed of in accordance with state law and entanglement hazards will be secured, making exposure to marine debris and entanglement hazards unlikely. Any increases in seafloor disturbance would be temporary, localized, and minimal. Based on the localized nature of small oil spills, the relatively rapid weathering expected, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action exposing fin or humpback whales to an oil spill is extremely small, and thus the effects are considered highly unlikely to occur. Large and very large oil spills are considered extremely unlikely to occur, and the effects from those events are therefore considered improbable. Mitigation measures and adherence to Clean Water Act regulations are expected to minimize the risk of exposure to the potential introduction of pollutants into the action area.

The increase in ship traffic due to the proposed action is unlikely to result in a vessel strike. Project vessels will be traveling at slow speeds, the increase in vessel traffic will be small, fin and humpback whales are uncommon in the area, and mitigation measures will be implemented. The likelihood of vessel strike is considered to be improbable.

Fin whales and humpback whales may experience stress responses as a result of noise from tugging activities. Individuals that show behavioral avoidance of the tugging activities are especially unlikely to incur auditory impairment or non-auditory physical effects because they will be further limiting the duration of their exposure. If an animal is not displaced and remains in the stressful environment (within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor. If TTS occurs, it is expected to be mild and temporary, and is unlikely to affect the long-term fitness of the affected individual. We do not expect fin and humpback whales to experience PTS from the proposed action. Noise from tugging activities may also mask acoustic signals important to fin whales and humpback whales. However, tugging activities will be intermittent (occurring over the course of six days during a one-year period) and affect a limited area, thereby limiting the potential for these species to experience chronic stress, repeated TTS, or extended periods of masking as a result of project activities. Additionally, Hilcorp will implement mitigation measures during project activities in order to minimize effects on listed marine mammals and reduce the likelihood that animals will be exposed to sound that could cause harassment.

The proposed activities may cause some individual whales to experience changes in their behavioral states; however, these responses are not likely to alter the physiology, behavioral ecology, and social dynamics of individual whales in ways or to a degree that would reduce their fitness. The most likely responses to noise from project activities include brief startle reactions or short-term behavioral modification. These reactions are expected to subside quickly when the exposure ceases. The primary mechanism by which behavioral changes affect the fitness of individual animals is through the animal's energy budget, time budget, or both. Additionally, tugging activities will only occur for a short duration and the calculated harassment thresholds are a small footprint in comparison to the available habitat in Cook Inlet. Fin and humpback whales may occur in the action area throughout all months of project activity; however, the area is only utilized occasionally and in small numbers by these species. The individual and cumulative energy costs of these potential behavioral responses are not likely to measurably increase energetic costs of fin or humpback whales, and their potential exposure to project-related noise is not likely to reduce their fitness.

Impacts to prey species are expected to be minor and temporary, given the small area of activity relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around ongoing operations. We consider potential adverse impacts to prey resources from project activities in the action area to be immeasurably small.

As mentioned in the Environmental Baseline section, fin whales, Mexico DPS humpback whales, and WNP DPS humpback whales may be impacted by a number of anthropogenic activities present in Cook Inlet. The high degree of human activity, especially within upper Cook Inlet, has produced a number of anthropogenic risk factors that marine mammals must contend with, including: coastal and marine development, oil and gas development, ship strikes, noise pollution, water pollution, prey reduction, research, and fisheries. These risk factors are in addition to those operating on a larger scale such as predation, disease, and climate change. These species may be affected by multiple threats at any given time, compounding the impacts of the individual threats. All of these activities are expected to continue to occur into the foreseeable future. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of fin whales, Mexico DPS humpback whales, or WNP DPS humpback whales.

8.2 Cook Inlet Beluga Whale Risk Analysis

Based on the results of the exposure analysis, we expect 15 Cook Inlet beluga whales may be exposed to noise from tugs towing, holding, and positioning the jack-up rig. Almost the entire Cook Inlet beluga population is found in northern Cook Inlet from late spring into the fall, and the area around the East Forelands between Nikiski, Kenai, and Kalgin Island appears to provide important habitat in winter, early spring, and fall. The most recent population estimate as of 2023 is 331 animals (Goetz et al. 2023). The trend in the updated time-series, including the 2021 and 2022 survey data, suggests the population is stable and may be slightly increasing (Goetz et al. 2023). From 2008 to 2018 the population showed a declining trend of 2.3 percent per year (Shelden and Wade 2019).

Exposure to noise from non-tugging activities (production drilling, vessel support operations, and aircraft support operations), marine debris, seafloor disturbance, and small oil spills may occur, but such exposure would have a very small impact, and are not expected to result in take of beluga whales. Impacts from noise associated with non-tugging activities are expected to be undetectable or minor due to the low density of belugas in the area, short duration of spatial overlap, low likelihood of exposure to sound that could significantly disrupt behavioral patterns, and implementation of mitigation measures. Trash will be disposed of in accordance with state law and entanglement hazards will be secured, making exposure to marine debris and entanglement hazards unlikely. Any increases in seafloor disturbance would be temporary, localized, and minimal. Based on the localized nature of small oil spills, the relatively rapid weathering expected, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action causing a small spill and exposing beluga whales is extremely small, and thus the effects are considered highly unlikely to occur. Large and very large oil spills are considered extremely unlikely to occur, and the effects from those events are considered improbable. Mitigation measures and adherence to Clean Water Act regulations are expected to minimize the risk of exposure to the potential introduction of pollutants into the action area.

The increase in ship traffic due to the proposed action is unlikely to result in a vessel strike. Project vessels will be traveling at slow speeds, the increase in vessel traffic will be small, and mitigation measures will be implemented. The likelihood of vessel strike is considered to be improbable.

Beluga whales may experience stress responses as a result of noise from tugging activities. Individuals that show behavioral avoidance of the tugging activities are especially unlikely to incur auditory impairment or non-auditory physical effects because they will be further limiting the duration of their exposure. If an animal is not displaced and remains in the stressful environment (within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor. If TTS occurs, it is expected to be mild and temporary, and is unlikely to affect the long-term fitness of the affected individual. We do not expect belugas to experience PTS from the proposed action. Noise from tugging activities may also mask acoustic signals important to beluga whales.

However, tugging activities will be intermittent (occurring over the course of six days during a one-year period) and affect a limited area, thereby limiting the potential for this species to experience chronic stress, repeated TTS, or extended periods of masking as a result of project activities. Additionally, Hilcorp will implement mitigation measures during project activities in order to minimize effects on listed marine mammals and reduce the likelihood that animals will be exposed to sound that could cause harassment.

The proposed activities may cause some individual belugas to experience changes in their behavioral states; however, these responses are not likely to alter the physiology, behavioral ecology, and social dynamics of individual whales in ways or to a degree that would reduce their fitness. The most likely responses to noise from project activities include brief startle reactions or short-term behavioral modification. These reactions are expected to subside quickly when the exposure ceases. The primary mechanism by which behavioral changes affect the fitness of individual animals is through the animal's energy budget, time budget, or both. Belugas forage year-round on seasonally available prey. Belugas congregate along the coast near river mouths in upper Cook Inlet during the spring and summer. The majority of the proposed action will occur farther from shore outside of primary foraging locations. Additionally, tugging activities will only occur for a short duration and the calculated harassment thresholds are a small footprint in comparison to the available habitat in Cook Inlet. The individual and cumulative energy costs of these potential behavioral responses are not likely to measurably increase energetic costs of beluga whales, and their potential exposure to project-related noise is not likely to reduce their fitness.

Impacts to prey species are expected to be minor and temporary, given the small area of activity relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around ongoing operations. We consider potential adverse impacts to prey resources from project activities in the action area to be immeasurably small.

As mentioned in the Environmental Baseline section, Cook Inlet beluga whales may be impacted by a number of anthropogenic activities present in Cook Inlet. The high degree of human activity, especially within upper Cook Inlet, has produced a number of anthropogenic risk factors that marine mammals must contend with, including: coastal and marine development, oil and gas development, ship strikes, noise pollution, water pollution, prey reduction, research, and fisheries. These risk factors are in addition to those operating on a larger scale such as predation, disease, and climate change. These species may be affected by multiple threats at any given time, compounding the impacts of the individual threats. All of these activities are expected to continue to occur into the foreseeable future.

Cumulative effects of multiple stressors (e.g. prey availability, anthropogenic activities, predation, subsistence harvest, pollution, habitat degradation) are considered high concern for the recovery of Cook Inlet belugas (NMFS 2016). All actions with a federal nexus have undergone extensive evaluation to understand potential project impacts and to develop appropriate mitigation measures. Most applicants operating in Cook Inlet in recent years have implemented strict mitigation measures to further reduce the likelihood that anthropogenic activity will affect the fitness of even a single beluga whale. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Cook Inlet beluga whales.

8.3 Western DPS Steller Sea Lion Risk Analysis

Based on the results of the exposure analysis, we expect nine Western DPS Steller sea lions may be exposed to noise from tugs towing, holding, and positioning the jack-up rig. The action area is not known to be highly utilized by Steller sea lions, and there are no haulouts or rookeries within the action area, which is the strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on the Western DPS Steller sea lion population.

Exposure to noise from non-tugging activities (production drilling, vessel support operations, and aircraft support operations), marine debris, seafloor disturbance, and small oil spills may occur, but such exposure would have a very small impact, and are not expected to result in take of Steller sea lions. Impacts from noise associated with non-tugging activities are expected to be undetectable or minor due to the low density of Steller sea lions in the area, short duration of spatial overlap, low likelihood of exposure to sound that could significantly disrupt behavioral patterns, and implementation of mitigation measures. The increase in ship traffic due to the proposed action is unlikely to result in a vessel strike. Project vessels will be traveling at slow speeds, the increase in vessel traffic will be small, and vessel strike is not considered a significant concern for Steller sea lions (only four reports of potential vessel strikes involving Steller sea lions have been reported in Alaska).

Exposure to non-biodegradable marine debris, specifically to debris that can cause entanglement, remains an unquantifiable risk, but associated effects from this project would be minimal. Any increases in seafloor disturbance would be temporary, localized, and minimal. Based on the localized nature of small oil spills, the relatively rapid weathering expected, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action exposing Western DPS Steller sea lions to an oil spill is extremely small, and thus the effects are considered highly unlikely to occur. Large and very large oil spills are considered extremely unlikely to occur, and the effects from those events are considered improbable. Mitigation measures and adherence to Clean Water Act regulations are expected to minimize the risk of exposure of Steller sea lions to the potential introduction of pollutants into the action area.

Steller sea lions may experience stress responses as a result of noise from tugging activities. Individuals that show behavioral avoidance of the tugging activities are especially unlikely to incur auditory impairment or non-auditory physical effects because they will be further limiting the duration of their exposure. If an animal is not displaced and remains in the stressful environment (within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor. If TTS occurs, it is expected to be mild and temporary, and is unlikely to affect the long-term fitness of the affected individual. We do not expect Steller sea lions to experience PTS from the proposed action. Noise from tugging activities may also mask acoustic signals important to Steller sea lions. However, tugging activities will be intermittent (occurring over the course of six days during a one-year period) and affect a limited area, thereby limiting the potential for this species to experience chronic stress, repeated TTS, or extended periods of masking as a result of project activities. Additionally, Hilcorp will implement mitigation measures during project activities in order to minimize effects on listed marine mammals and reduce the likelihood that animals will be exposed to sound that could cause harassment.

It is difficult to estimate the behavioral responses, if any, that Western DPS Steller sea lions in the action area may exhibit to underwater sounds generated by project activities. Though the sounds produced during project activities may not greatly exceed levels that Steller sea lions already experience in Cook Inlet, some of the sources proposed for use in this project are not among sounds to which they are commonly exposed. In response to project-related sounds, some Steller sea lions may move out of the area or change from one behavioral state to another, while other Steller sea lions may exhibit no apparent behavioral changes at all. Potential reactions are expected to subside quickly when the exposure to project noise ceases.

The primary mechanism by which the behavioral changes may affect the fitness of individual animals is through the animal’s energy budget, time budget, or both. Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (NMFS 2008b). The closest major rookery or haulout is over 100 km away from the action area. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to measurably reduce the energy reserves of Steller sea lions in the action area.

The probable behavioral responses (i.e., tolerance, short-term masking) to close approaches by vessel operations and potential exposure to noise from tugging activities are not likely to reduce the current or expected future reproductive success or reduce the rates at which Steller sea lions grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or survival and growth rates of the population those individuals represent.

The proposed action may cause some individual Steller sea lions to experience changes in their behavioral states that may have adverse consequences (Frid and Dill 2002). However, these responses are not likely to alter the physiology, behavioral ecology, or social dynamics of individual Steller sea lions in ways or to a degree that would reduce their fitness. Western DPS Steller sea lions may occur in the action area throughout all months of project activity; however, the area is only utilized occasionally and in small numbers.

Impacts to prey species are expected to be minor and temporary, given the small area of activity relative to known feeding areas of listed marine mammals. We expect fish will be capable of moving away from project activities to avoid exposure to noise. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around ongoing operations. We consider potential adverse impacts to prey resources from project activities in the action area to be immeasurably small.

As mentioned in the Environmental Baseline section, Western DPS Steller sea lions may be impacted by a number of anthropogenic activities present in Cook Inlet. The high degree of human activity, especially within upper Cook Inlet, has produced a number of anthropogenic risk factors that marine mammals must contend with, including: coastal and marine development, oil and gas development, ship strikes, noise pollution, water pollution, prey reduction, research, subsistence harvest, illegal poaching, and fisheries. These risk factors are in addition to those operating on a larger scale such as predation, disease, and climate change. The species may be affected by multiple threats at any given time, compounding the impacts of the individual threats. All of these activities are expected to continue to occur into the foreseeable future. Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival or recovery of Western DPS Steller sea lions.

As we discussed in the Approach to the Assessment section of this opinion, an action that is not likely to reduce the fitness of individuals would not be likely to reduce the viability of the populations those individuals represent. That is, we would not expect reductions in the reproduction, numbers, or distribution of such populations. For this project, we do not expect that the sound created by tugs towing, holding, and positioning the rig will reduce the fitness of any individual marine mammals. An action that is not likely to reduce the viability of those populations is not likely to increase the extinction probability of the species those populations comprise; in this case, the fin whale, Mexico and WNP DPS humpback whale, Cook Inlet beluga whale, and Western DPS Steller sea lion. As a result, the proposed action is not likely to appreciably reduce the likelihood of recovery or survival of the fin whale, Mexico or WNP DPS humpback whale, Cook Inlet beluga, or Western DPS Steller sea lion.

9 CONCLUSION

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the fin whale, Mexico or Western North Pacific DPS humpback whale, Cook Inlet beluga whale, and Western DPS Steller sea lion or to destroy or adversely modify designated Cook Inlet beluga whale critical habitat.

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. § 1532(19)). "Incidental take" is defined as take that results from, but is not the purpose of, the carrying out of an otherwise lawful activity conducted by the action agency or applicant (50 CFR § 402.02). Based on NMFS guidance, the term "harass" under the ESA means to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which: (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or, (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. § 1362(18)(A)(i) and (ii)). For this consultation, it is expected that take of fin whales, Mexico or WNP DPS humpback whales, Cook Inlet beluga whales, or Western DPS Steller sea lions will be by Level B harassment. No take due to harm (Level A) is expected or authorized in this biological opinion.

The ESA does not prohibit the take of threatened species unless special regulations have been promulgated, pursuant to ESA section 4(d), to promote the conservation of the species. Federal regulations promulgated pursuant to section 4(d) of the ESA extend the section 9 prohibitions to the take of Mexico DPS humpback whales (81 FR 62260; September 8, 2016) (50 C.F.R. § 223.213).

Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS).

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by section 101(a)(5) of the MMPA. Accordingly, **the terms of this incidental take statement and the exemption from section 9 of the ESA become effective only upon the issuance of a MMPA authorization to take the marine mammals identified here**. Absent such authorization, this incidental take statement is inoperative.

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. NMFS Permits Division has a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, Hilcorp must monitor and report on the progress of the action and its impact on the species as specified in the ITS (50 CFR § 402.14(i)(3)). If NMFS Permits Division (1) fails to require the permit holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization and/or, (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14(i)(1); see also 80 FR 26832; May 11, 2015).

NMFS is reasonably certain the proposed Hilcorp project activities are likely to result in the incidental take of ESA-listed species by Level B harassment associated with noise from tugs towing, holding, and positioning the jack-up rig. The taking by serious injury or death is prohibited and will result in the modification, suspension, or revocation of the ITS. Table 16 lists the amount and timing of authorized take for this action. The method for estimating the number of listed species exposed to sound levels expected to result in Level B harassment is described above in the Exposure Analysis.

NMFS expects that two instances of Level B harassment of fin whales may occur. NMFS expects that three instances of Level B harassment of humpback whales may occur. While we are only authorizing take of one Mexico or WNP DPS humpback whale under the ESA, we will consider the ESA-authorized take limit to be exceeded when the MMPA-authorized limit on Level B take of humpback whales is exceeded, as it is often impracticable to distinguish between humpback whale DPSs in the field. NMFS expects that 15 instances of Level B harassment of Cook Inlet beluga whales may occur. NMFS expects that nine instances of Level B harassment of Western DPS Steller sea lions may occur.

Table 16. Incidental take of ESA-listed species authorized.

Species	Total Amount of Take		Duration Across which Take Will Occur
	Level A	Level B	
Fin whale	0	2	12 months
Mexico and WNP DPS Humpback whale	0	1	
Cook Inlet beluga whale	0	15	
Western DPS Steller sea lion	0	9	

10.2 Effect of the Take

In Section 9 of this opinion, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species.

Although the biological significance of the expected behavioral responses of fin whales, Mexico DPS humpback whales, WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions remains unknown, this consultation has assumed that exposure to disturbances associated with Hilcorp oil and gas activities might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these whales and pinnipeds to major sound sources, and any associated disruptions, are not expected to measurably affect the reproduction, survival, or recovery of these species. The taking of fin whales, Mexico DPS humpback whales, WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions will be by incidental acoustic harassment only, analogous to MMPA Level B take via behavioral disturbance or temporary threshold shift in their hearing.

10.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take" (50 CFR 402.02). Failure to comply with RPMs (and the terms and conditions that implement them) may invalidate the take exemption and result in unauthorized take.

RPMs are distinct from the mitigation measures that are included in the proposed action (described in Section 2.1.2). We presume that the mitigation measures will be implemented as described in this opinion. The failure to do so will constitute a change to the action that may require reinitiation of consultation pursuant to 50 CFR § 402.16.

The RPM included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPM is necessary and appropriate to minimize or to monitor the incidental take of fin whales, Mexico and WNP DPS humpback whales, Cook Inlet beluga whales, and Western DPS Steller sea lions resulting from the proposed action.

- The NMFS Permits Division and Hilcorp must monitor and report all authorized and unauthorized takes, and monitor and report the effectiveness of mitigation measures incorporated as part of the proposed authorization for the incidental taking of ESA-listed marine mammals pursuant to section 101(a)(5)(D) of the MMPA. In addition, they must submit a report to NMFS AKR that evaluates the mitigation measures and reports the results of the monitoring program.

10.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. These terms and conditions are in addition to the mitigation measures included in the proposed action, as set forth in Section 2.1.2 of this opinion. The NMFS Permits Division, or any applicant, has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR § 402.14(i)(3))).

Any taking that is in compliance with these terms and conditions is not prohibited under the ESA (50 CFR § 402.14(i)(5)). As such, partial compliance with these terms and conditions may invalidate this take exemption and result in unauthorized, prohibited take under the ESA. If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the action may lapse.

These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out the RPM, NMFS Permits Division or Hilcorp must:

- Provide NMFS AKR with written and photographic (if applicable) documentation of any effects of the proposed action on listed marine mammals and implementation of the mitigation measures specified in Section 2.1.2 of the biological opinion.

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR § 402.02).

NMFS AKR recommends that NMFS PR1 use its authorities to encourage Hilcorp to do the following:

- Delay delivery of supplies, when feasible, if marine mammals are sighted from the platform.
- Continue to support and be involved in the annual Cook Inlet Belugas Count! event.
- Become an Alaska Beluga Monitoring Program partner and host a site in Knik Arm, and promote participation at the Kenai and Kasilof sites.
- Continue to support and be involved in the Cook Inlet Beluga Whale Recovery Implementation Task Force.
- Work with NMFS AKR to place Cook Inlet beluga educational signage north along the coast from Kenai, with a focus on Captain Cook State Recreation area.
- Work with NMFS AKR to pursue actions that would protect Cook Inlet beluga whale habitats important for feeding or reproduction, particularly in and near rivers that support large populations of salmon or eulachon used by Cook Inlet beluga whales. For example, work with NMFS AKR to collect data on important Cook Inlet beluga prey species to address existing information gaps.
- Work with NMFS AKR to better understand the distribution and density of marine mammals, particularly large cetaceans, in Cook Inlet. For example, work with NMFS AKR to support research such as aerial and vessel surveys, acoustic equipment deployment, and photo identification efforts.
- Continue to work with NMFS to support research to understand the impacts of anthropogenic activities on marine mammals in Cook Inlet. For example, cooperate on the installation of passive acoustic monitoring equipment on platforms and docks to document noise levels and the presence, absence, and feeding activity of marine mammals near platforms and key transportation areas.

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, Hilcorp should notify NMFS AKR of any conservation recommendations they implement in their final action.

12 REINITIATION OF CONSULTATION

As provided in 50 CFR § 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately (50 CFR § 402.14(i)(4)).

13 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS Permits Division and the general public. These consultations help to fulfill multiple legal obligations of the named agency. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website https://www.fisheries.noaa.gov/tags/section-7-consultation. The format and name adhere to conventional standards for style.

13.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources', Office of Management and Budget Circular A-130; the Computer Security Act; and, the Government Information Security Reform Act.

13.3 Objectivity

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR § 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

14 REFERENCES

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